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Using Cast-Iron Bars in Automatics

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Casting and cleaning the bars—Pointing and "skinning" to size—Special steadyrest—How the bars are used in the automatic machines

THE USE OF FULL automatic screw machines for turning cast iron has for the most part, been limited to special work where the castings were sufficiently accurate to be handled by a magazine feed. Semi-automatics are of course widely used in what may be called chucking work but the use of the full automatic on cast-iron bars may be classed as an innovation.

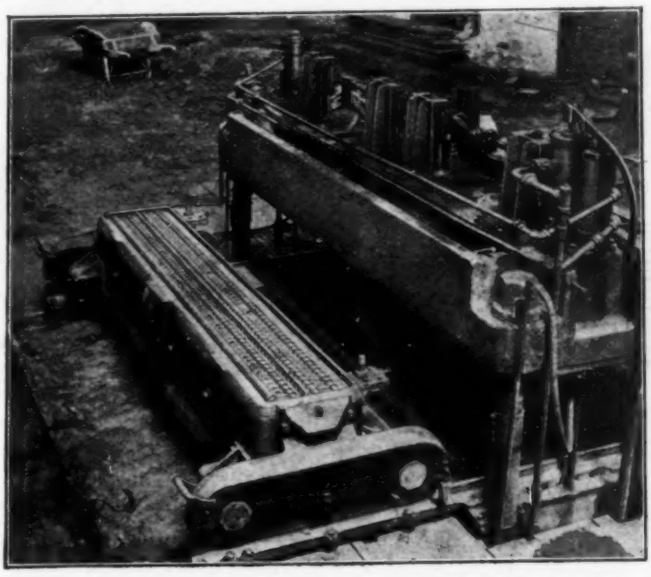


FIG. 1—THE MOLD WITH FOUR PATTERNS IN PLACE

A number of years ago some of the engineers at the Elizabethport factory of the Singer Manufacturing Company began experimenting with the use of cast-iron bars in full automatic machines with fair success. These bars were about ⅝ in. in diameter and 28 in. long and were machined on a Hartford automatic. While the experiment acomplished all that was expected of it at that time, it did not seem to grow and the matter remained dormant until a few years ago. The present development can hardly be considered as directly related to the former although it, of course, grew out of the first experience.

The first problem presented was to secure cast-iron bars of sufficient length so as not to require too frequent attention on the part of the operator. Plain round bars were naturally the first consideration and eight foot lengths were decided upon as being sufficient for the purpose. Following the use of plain bars, however, came the idea of casting the bars as nearly to the shape of the finished pieces as practicable and in this way, obtain a decided advantage over the use of plain bar stock.

In order to cast these bars economically a special molding machine of the squeezer type was designed and built at the Singer plant. This machine is shown in Fig. 1 with four metal patterns in place, all being of the formed type just referred to. The gates are of small section and the mould is poured at several places so as to insure a fairly uniform flow of the molten iron.

After the castings are shaken out of the mold and snagged in the usual manner, they go to the rumbler

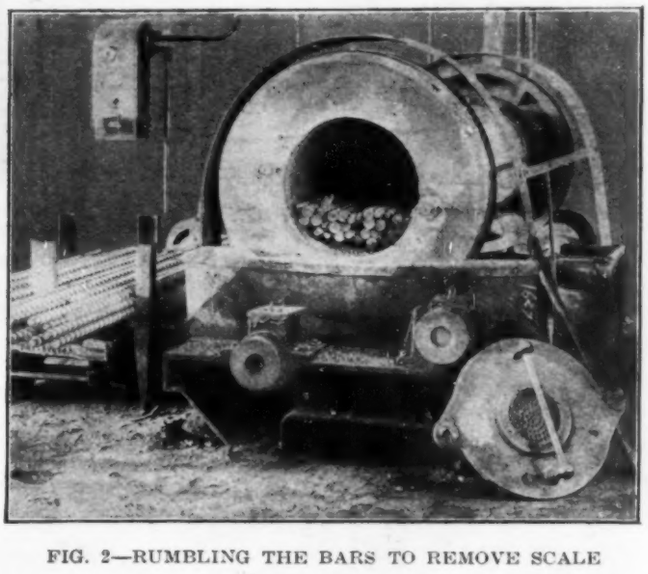
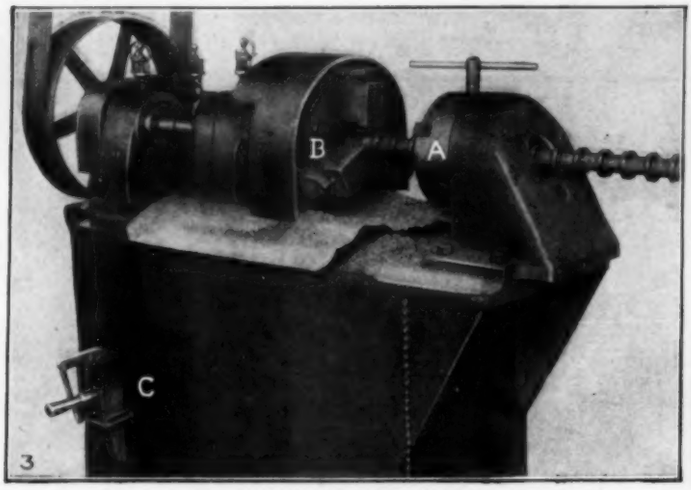


FIG. 2—RUMBLING THE BARS TO REMOVE SCALE

shown in Fig. 2. The rumbler is filled fairly full in order to prevent breakage of the bars by dropping any considerable distance, but space enough is left so that they can move freely and so that the stars and other rumbling material which is put in can have the desired action.

When the rough scale has been removed the bars go to the rough turning department to be prepared for use in the automatics. The first operation is called pointing by which one end of the bar is turned to a diameter



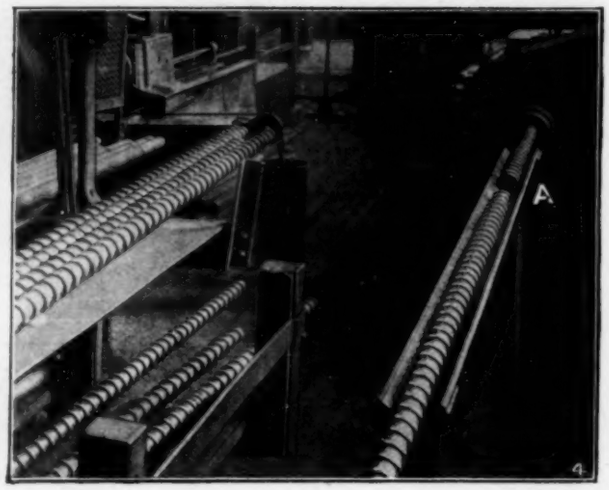
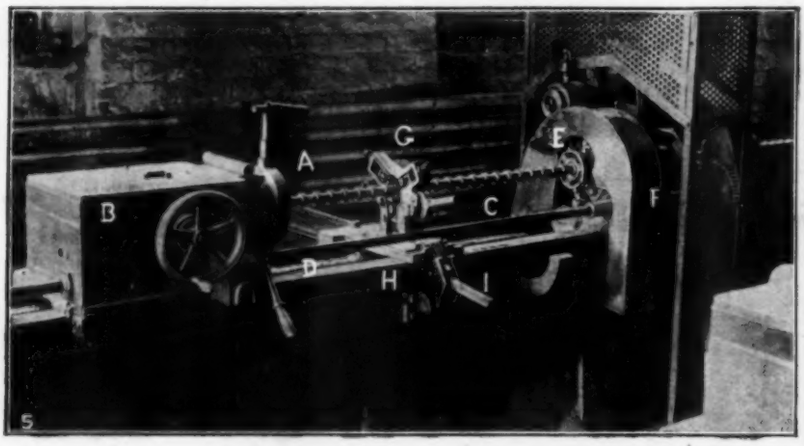


FIG. 3—POINTING OR ROUGH-TURNING THE ENDS. FIG. 4—FEEDING THE BARS TO THE TURNING MACHINE

which will permit it to pass through a standard bushing and be gripped by the jaws which pull it through the cutter head. The pointing or end turning machine is shown in Fig. 3. The bar to the turned is gripped in the substantial three-jaw chuck *A*, with the end projecting sufficiently to allow the cutter head to turn a distance of approximately six inches on the end of the bar. The cutter head *B*, is in reality a revolving hollow mill mounted on a spindle and is fed over the work by means of a cam feed which trips automatically after the desired travel. The feed trip and the return are controlled at *C*. After pointing, the bars are ready for the turning or "skinning" machine, being fed into it as shown in Fig. 4. A pointed or turned down end is shown at *A*,



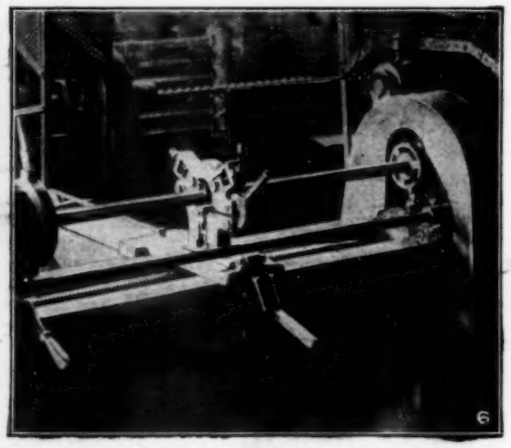


FIG. 5—HOW THE BARS ARE TURNED. FIG. 6—TURNING A PLAIN BAR

ready to be gripped by the jaws which feed it. Fig. 5 shows a bar about half turned. The prepared end is held at *A*, the head *B* being fed by the rod *C* and suitable gearing meshing in a rack with teeth cut vertically, at *D*. The bushing which acts as a gage and which also supports the work close to the revolving tool head, is shown at *E*. The tool head is inside the guard *F*.

In order to support the bar against deflection, the special steadyrest *G* was designed. It not only has a quick acting clamp for fastening the upper half to the lower, but is mounted on a base which can be readily moved back out of the way when the head *B* is moved forward to grip a new bar. This base is notched at the front end to receive the link *H* and has a pocket into which the pin in the upper end of the link fits as the link is pulled down by the handle *I*. The steadyrest is also counterweighted as can be seen in Fig. 7 so that, as soon as the upper half is opened and the link *H* released, the whole steadyrest slides back out of the way until needed for the next bar.

A very similar illustration is shown in Fig. 6 except that the machine is turning a plain round bar. The bars run up to a diameter of two inches or a little over.

Details of the tool head are shown in Fig. 7. There

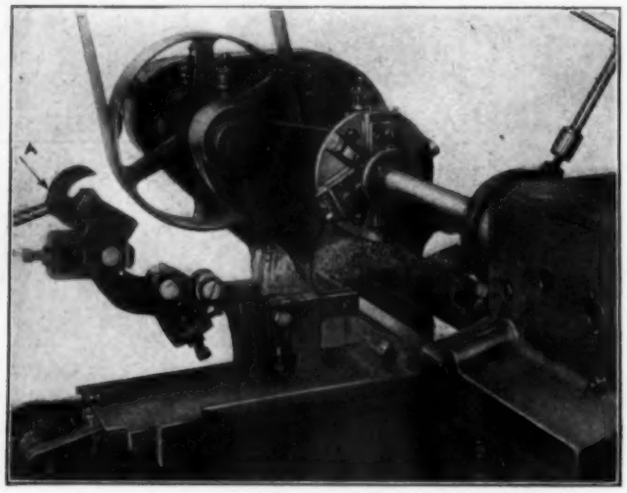


FIG. 7—DETAILS OF CUTTER HEAD AND STEADY REST

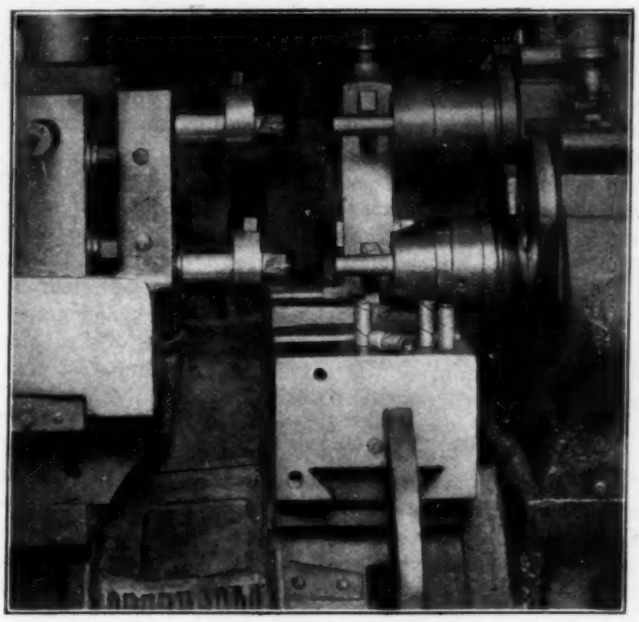


FIG. 8—TURNING CAST IRON PARTS ON A HARTFORD AUTOMATIC

are three cutting tools and three supporting jaws which aid in keeping the work round and very close to size. Although this operation is one of rough turning, designed solely to make the bars uniform for use in automatic machines, the tolerance is only 0.005 in. This view also shows the details of the steady rest in which the usual practice is reversed by having one jaw at the bottom and two in the movable portion. The reasons for this is to completely clear the bar when the rest is to be moved back out of the way. The clamp for locking the steady rest over the work is shown at *A*.

This department completes the preparation of the bars for the automatic machine and, although it might seem as though it does considerable work on the castings, the machines are so simple in construction and operation and require so little attention, that the cost of preparing the bars is extremely small. No particular attempt is made to have the bar straight as this is no more necessary in the case of cast iron than with drawn-steel stock.

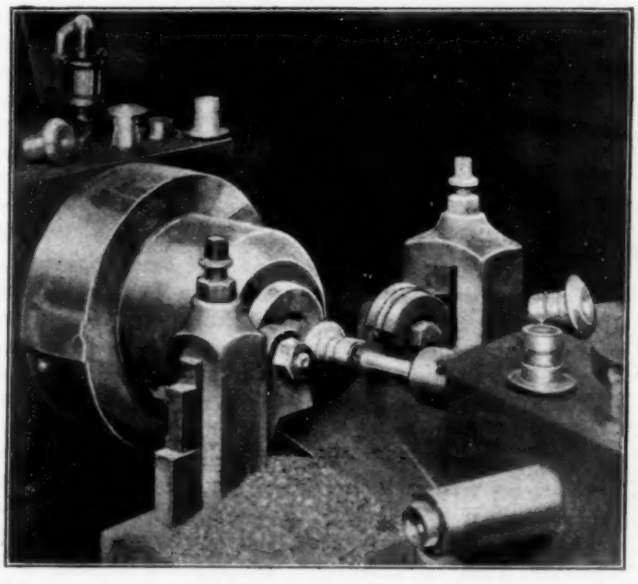


FIG. 9—ANOTHER JOB ON A HARTFORD

With the plain round bars the feed in the automatic works in exactly the same manner as with steel-bar stock. With the formed bars having the collars cast on them, the feeding mechanism has been changed so that instead of gripping the surface of the bar, the fingers drop behind the collars and push against them during

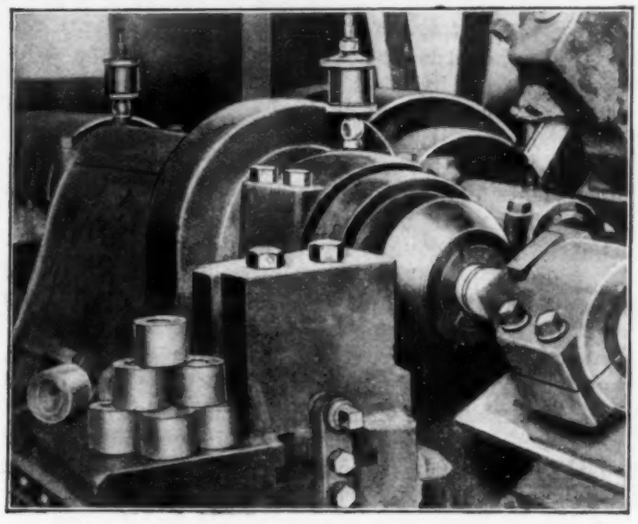


FIG. 10—TURNING TAKE-UP CAMS ON A GRIDLEY

the feeding action. In this way, there is no accumulated error due to contraction or other distortion in the castings and only a minimum allowance of metal is necessary on the collars.

The remaining illustrations show different operations on automatic screw machines using cast-iron bars. Fig. 8 shows a Hartford machine making small bushings from the straight bar. Fig. 9 is a similar machine using one of the flanged bars which greatly reduces the amount of metal to be removed. In tooling for this work care is taken to start the tools on clean metal

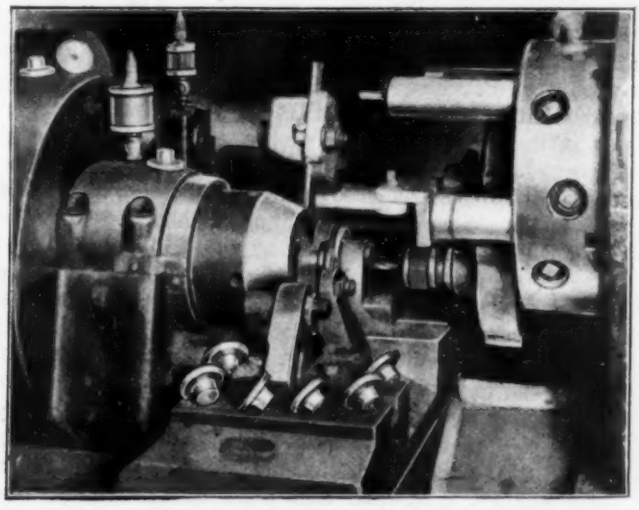


FIG. 11—PRODUCING COMPLETE GEAR BLANKS ON A CLEVELAND

wherever possible and so avoid the destructive effect of scale on the cutting edges. This is done so effectively that no trouble is experienced from this source. Fig. 10 shows a Gridley automatic operating on a plain bar. The bar and the work are shown quite plainly. A Cleveland automatic is shown in Fig. 11, making complete gear blanks which can be seen on the tool slide.

Another Machinist Has Reminiscences

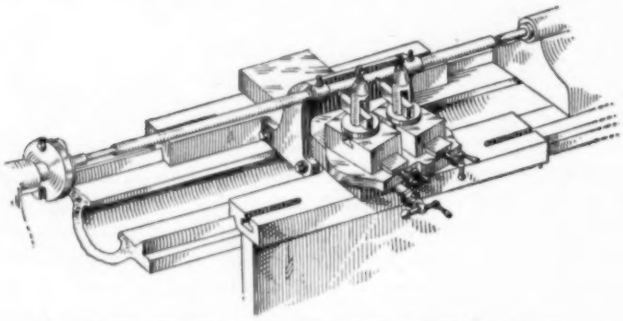
By S. R. Hunter

The experience in threading large screws in a lathe, as described by Steven McEvoy on page 333, Vol. 57 of the *American Machinist* reminds me of a somewhat similar experience in chasing lead screws in a lathe.

There was a total of about three hundred of these screws on the order, so we were not handicapped as Mr. McEvoy was in not having enough to justify proper tooling. We were, however, limited for time and, aside from accuracy which was of the first consideration, the lead screws had to be produced in time to meet the requirements of the assembling department. The threads all had to be cut on one lathe, a new 18 in. Lodge & Shipley equipped with pan and pump for cutting compound, as the other lathes in the shop were all too old and inaccurate to turn out a job that would be considered satisfactory.

The stock used was 1¼ in. Cumberland shafting, ground to within 0.0005 in. of size and the required thread was Acme standard 4 threads to the inch.

The blanks, about six feet in length, were all centered and the head stock end turned in another lathe; the object in turning one end only being to enable the operator to have some place for his tool to run out



SPECIAL SET-UP FOR CUTTING ACME THREAD LEAD SCREWS

at the end of the cut. The stock was reduced at this point for a distance of four inches to a diameter just below that of the root of the thread. The other end of the finished screw was to be turned down for a bearing, but this was left until after the threads were cut so that in the event of the thread being mutilated at the start there would still be a chance to save the screw when the end was turned down.

Various schemes for reducing the machining time were suggested and discarded; because of fear that the finished product would not pass the inspector. It was finally decided to make the follow rest shown in the illustration. This rest was accurately machined to fit the bridge of the lathe carriage, at the same time leaving plenty of room for the cross slide to pass freely underneath. The rest was provided with two arms which extended upward and back of the center line of the lathe spindle so as not to interfere with the movement of the compound rest, the arms each supporting a rest for the shaft to be threaded.

After bolting the follow rest firmly in place, the arms were drilled by using a drill in the lathe spindle and were then bored accurately to size by means of a boring bar on centers. The holes were bushed with bronze collar-bushings, the collar being toward the headstock. The bushings were made a light press fit for the holes in the arms so they could be removed easily and replaced after they had become too badly worn for further use. A set screw was used which prevented the bushings from turning. (The first bushings were made of hardened tool steel, but were found to be unsatisfactory on account of their tendency to crack and to mutilate the top of the thread.)

A special compound swivel slide was designed. It was graduated in degrees and provided with two independent slide rests setting parallel and with independent feed screws, each having a micrometer collar. Two tool posts were used. The forward one (the one nearest the headstock) was provided with a simple parting tool the width of which was just under the width of the flat at the bottom of the thread. The other tool was ground to the correct shape of an Acme thread.

How the Tools Were Set

The compound swivel was now swung over to an angle of 14½ deg. and the two tools set just as nearly four inches center to center as possible. It was found best to set the forward tool first and take a light cut, the other tool being afterwards set to the light thread outlined. A special long dead center was, of course, required to enable the follow rest to be run back far enough to start the cut at the end of the blank. After the tools were once set, the cross side was locked in place and the cross slide stop set up against it. This made it much easier to reset the tools after grinding. The leading tool was set by the micrometer on the cross slide feed screw to cut 0.020 in. deeper than the forming tool, leaving sufficient stock at the sides to enable the latter to clean up, at the same time allowing clearance at the bottom of the thread. A bracket was provided to support a distributor for the cutting compound used so that both of the tools could be flooded, but in spite of this precaution the tail center had to be backed up two or three times during the roughing operation on account of the expansion due to heat.

In operation the two tools were adjusted by hand for each succeeding cut, both tools being fed in at an angle of 14½ degrees, the parting tool cutting at the bottom and left hand side of the thread while the forming tool which followed cut only on the two sides. The 0.020 in. advance setting of the leading tool enable the forming tool to take a heavy enough cut without touching the bottom of the cut left by the parting tool. It was found preferable to take a comparatively heavy cut at medium speed rather than to take a light cut at high speed and, as the follow rest prevented the bar from springing, there was no danger of the work chattering or of the tools hogging in. The screws were finished in a second operation, using the same fixtures and a single tool made to conform to a ¼ in. pitch Acme thread.

The only weakness in this method was found to be that the bronze bushings required replacing at frequent intervals, due to the burr thrown up by the cutting tools tapping a thread in the bushings. As long as the tools were left in one position the tapped thread was always in the same place, but when the tools were removed it was next to impossible to set them exactly as they were and the wear of the bushings was rapid. The total time consumed in chasing the threads of the lead screws was reduced to less than one-third of the time required by the old method where a single tool and back rest were used. The lead screws were, in addition, more accurate both as to pitch as well as to depth and form of thread.

Exporting Small Tools and Machinery

By H. D. PARKER
Assistant Foreign Sales Manager, Greenfield Tap and Die Corporation

Changes in foreign markets after the war—Distributive systems—Qualities essential in a salesman—Sound credit and payment schemes—Advertising in foreign countries

IN THE PRESENT day complexity of wants which must be supplied with products not native to any given country, it is fundamental that importing must be carried on to a certain extent. In the United States, the coffee habit, the craving for sweets, the use of cocoa, rubber and the thousand and one products which either cannot be grown within our borders or are not produced in sufficient quantities to balance the demand, induce imports, the yearly values of which run into large amounts.

To balance this bill for imported goods, payment can be made only through the medium of other goods in exchange, the movement of gold, or in services. Of these three, the first is the simplest, and at the same time the most profitable to our nationals. Added employment and internal advantages are derived through the reduction in unit cost secured by increasing the number of units produced by quantity methods. This exporting of our surplus is an easy way to pay for our imports where the surplus is a natural one. It is also a profitable thing where the surplus is artificial because it increases the units of mass production. Thus the importance of export to each individual of our population can be realized. The domestic demand for an article is, let us say, for 100,000 units yearly and each unit costs $1 to make and market. An added foreign demand of 50,000 units yearly will reduce the cost per unit on the 150,000 units manufactured to a marketing price of 85c. and will not only maintain the previous wage scale but will offer added employment. The remote consumer, far from the activities of a manufacturing center or port may not realize that the article over the price of which he grumbles would be still more expensive were it not for the exportable surplus produced.

The importance of foreign trade is only just being actually appreciated by the majority of people in the United States. Its vital influence in business has, of course, long been recognized. This influence is especially strong in connection with products which lend themselves naturally to large scale production, as wheat, textiles and small tools. It is the movement of such goods viewed from the angle of either value or tonnage that gives our index of export prosperity. In the case of the small tool industry the United States is able to compete successfully with the world because of the expert work of its mechanics, the excellence of its materials, and its highly developed production methods. The exportable surplus in the small tool industry stabilizes production, neutralizes the effect of slack domestic demand, and keeps in equilibrium the various factors connected with purchasing and merchandising.

> THE EXPORTABLE surplus in the small tool industry stabilizes production, neutralizes the effect of slack domestic demand and keeps in equilibrium the various factors connected with purchasing and merchandising.
>
> Knowledge of the language is not necessary for a salesman, but he must know the line he is selling and the policies of the home office. He must have the education, breeding and bearing to represent his firm courteously, firmly and with dignity. He must possess the experience which teaches that to each nation its own customs are best and must realize that what is called "flag waving" is not his mission.

A product consisting of both small tools, pipe tools, gages and four distinct machinery lines, naturally is exported in different ways to different countries, and clearly the demand will vary from nation to nation. Before the war Europe was the great consumer abroad of American small tools and fine machinery. These products were distributed among the various European countries in proportion to their mechanical development. During the war certain countries were cut off and ceased to be of interest as customers. These countries, broadly speaking for the fine metal trades, have not since come back as purchasers, and will not come back for an indefinite time. The balance of Europe buys haltingly and in small quantities.

On the other hand, during the war the pressure of necessity developed industrially many countries which were but secondary consumers of hardware and tools before 1914. Australia, Japan and to a less degree India, the Dutch East Indies and China increased their demands upon us for our products until volumes were reached far in execess of pre-war figures. Many of these countries will never return to their previous dependence on imports because their own industries are now established. Australia has produced and exported automobiles selling sucecssfully in London. China has smelted and rolled plate iron which has been sold on our own Pacific coast. Japan has built ships for our own shipping board in Japanese yards. This production in turn will eventually lead to a certain competition among

native producers of tools and machines now imported from American producers. For the present, however, even where the tremendous tariff protection is in force in Australia, American quality is so much superior to the domestic article that it maintains the volume of demand.

In dealing with the small tool and machinery exporting problem from the angle of a world wide distribution, it is appreciated that various methods will be most successful in different places. Also there will be two or three different distributive systems in operation at the same time in the same country. The export commission house will take care of the distribution in any country, but with the possible exception of two or three very strong houses, the exporter will find that other methods will be equally profitable in the majority of countries, and more profitable in several countries.

Speaking generally, the small tool trade exports through the commission house to South America, the Far East, South Africa, Australia and Europe in the order named as to intensive effort. It deals with Europe and the Dutch East Indies respectively through the foreign export commission house whose main offices are in Amsterdam, Brussels, Paris, Hamburg and London. The last named house reaches all of the British Empire, to a small extent. Very few small tool exporters make use of New York export agents to any extent as these agents are able to function much more satisfactorily in connection with non-technical lines as a rule. There are, however, two or three such agencies which practically dominate the Oriental and Far Eastern trade in hardware.

Methods Used by the Larger Exporters

The larger exporters of the metal tool trade have their own agents and branches established in the strategic centers, where large stocks are carried for quick service, and their own salesmen cover the country intensively. Branches in London, Havana, Mexico City, Buenos Aires and Canada, with resident agents with stocks in each capital and industrial center of Europe, Port of Spain, Georgetown, Rio, Santiago, Lima, Guayaquil, Cali, Bogota, Barranquilla, Caracas, and Alaska are maintained by one of the largest tool manufacturers in the world, together with resident agents (selling) without stocks but with large wholesale dealers carrying stocks in the same cities in Cairo, Cape Town, Johannesburg, Karachi, Delhi, Colombo, Madras, Lahore, Calcutta, Rangoon, Singapore, Batavia, Bangkok, Manila, Hongkong, Shanghai, Kobe, Tokyo, Honolulu and with resident salesmen in Australia. In the last country an example of the result of definite sales work may be cited. The products of this company are on sale in every hardware, ironmongery and general store throughout Australia, New Zealand and Tasmania. These branches, resident agents, selling agencies and resident salesmen cover their territories intensively, distribute catalogs, take care of complaints and quote prices. They secure orders which are handled according to the class to which they belong. Branches and agencies with stock naturally fill from their own stocks which they replenish as necessary from the home factories. Selling agents secure orders from large estates and wholesalers, which orders (indents) are sent to the home office for shipment. This scheme is also used by the resident salesmen. It is left for the importer to travel the retail trade of his country, but the demand is stimulated and enlarged by advertising copy from the home office.

All letters sent by the home office into any territory are made in duplicate, the copy going to the agent for the territory. Direct orders are filled but direct requests are referred back to the local representative. All contracts reserve the right to deal direct in any territory for the home office, but on such direct sales the agent's commission is payable exactly the same as on business sent through the agent. This scheme prevents price juggling and also takes care of those importers who insist on direct contact with the home organization. Knowledge of the language, while of course valuable, is by no means the most necessary requirement for the foreign salesman. In fact, it is not necessary. But the salesman must know the line he is selling and the policies of the home office. He must have education, breeding, and bearing to represent his firm courteously, firmly and with dignity. He must have the experience which teaches that to each nation its own customs are best, must realize that what is called "flag waving" is not his mission, and must be of that type which will build good will for the home office wherever he goes.

Advertising and missionary work stimulate sales. A certain amount of general copy will naturally be placed with American publishers whose publications are technical or of an export nature. This copy, however, will reach only the executive, the importer, the engineer and the jobber, to a large extent. When consumer and dealer stimulus is needed local campaigns will be carried out in conjunction with the local agent, in the medium he suggests, and he usually will be called on to stand half the cost. Missionary men will educate the jobbers and sales force, visit the large consumers, and do about the same work in the foreign field that they do domestically. The home office at the same time will include with every outgoing export letter literature in the language of the addressee, and such material will be furnished in quantities gratis to all dealers who ask for it. Such a letter should never be placed with outgoing shipments unless express instructions to do so are given by the consignee for customs reasons.

Going back for an instant to the agency question, the term "exclusive agency" has many interpretations. The best for the small tool and machine trade to use, it would seem, is that which says in effect "exclusive as to profits only." In other words, it is better to retain the right to sell direct in any territory, but to pay a commission on all sales entering a territory. In exporting machinery and tools the question of a subagency will give small trouble for in the nature of the goods subagencies will almost always be branches of the agent's own domestic organization.

Reaching the Ultimate Consumer

Having secured adequate agency and agent representation in any country, the next step (which is not to be undertaken until the first has been accomplished) naturally calls for the development of the territory and the stocking of the product on every shelf in the country. These stocks will in every case be secured through large importations from the home plants. The agent, if a merchant, will import for resale, also the larger jobbers of his country will import through him or direct, for the same end. The smaller jobber will buy from the large importer, and all will sell to the dealer and large consumer, who in turn reaches the ultimate consumer. This, in effect, is the course of the product in every foreign country as in our own. The names are often queer, the functions confused, the technic dis-

tracting, but under it all, the line which efficient merchandising would follow in the United States can be found, and it will lead to success in the export field.

"Who pays for the goods and how?" The methods of financing small tool and machine accounts differ in each country and with each type of consumer. A broad tabulation would be about as follows:

Open account. (Branches and best agencies.)

Documents against acceptances of draft. (Agencies and best customers.)

Documents against payment of draft. (General run of customers, new accounts, and all where possession of goods is desirable until payment is made. This scheme is not possible in Colombia and Venezuela.)

Bargain money of about 25 per cent to come with order. (Japan and other Oriental countries where this is the custom. Heavy machine installations in China often carry several payments made at specified times as work progresses.)

Cash in advance or irrevocable letter of credit with order. (All cases where there is a sufficient element of risk to preclude any of the above.)

The dating of drafts is a matter where custom and usage have considerable voice. Also the source of internal payments is a strongly modifying factor. Countries depending on the goods reaching them from distant points as a rule require longer time than nearby dealers. In any case through the advantage of credit insurance it is now possible to insure the solvency of a customer, and through the First Foreign Federal Bank of New York to secure without delay money for whatever form of draft drawn on the client. Where indents are received through the salesmen or selling agents, detailed financing instructions should have accompanied the order. When the order is received through a commission house, the manufacturer will bill it and the matter becomes as simple as a domestic account.

Unfortunately there has been some talk regarding the difficulty of getting money in return for export shipments. It may be definitely stated that while there is admittedly more detail financially connected with the average export shipment than there is with a domestic bill, the securing of the money is not more difficult. Through the very nature of the facilities offered, the money is often placed to the credit of the exporter's account before he has received the payment for domestic bills of the same date.

Means of Securing Sound Credit

By educating all who send export orders to include full financing information, by making use of the facilities for credit data offered by the large banks, the export organizations such as the American Manufacturers' Export Association and the Export Managers Club, the Philadelphia Museum, and the important export publications, by insuring the solvency of the clients, and by making use of acceptance supported by several export drafts as a means of securing cash payments quickly on other than open account customers, the credit and payment end of the business becomes as sure, in fact surer, than the domestic collections.

Publicity with a few exceptions is paid for by the exporter. Naturally every letter is answered in the language in which it was written, and when sent out it is of a proved advantage for the export department to include material in the same language. Catalogs in English and Spanish are enough where the large and detailed issues are considered. Abbreviated catalogs in Portuguese are profitable for Brazil. Circulars covering special items or allied items should be available in English (not American), Spanish, Portuguese, Japanese and Chinese. These circulars are made up with an imprint blank where the dealer or his subdealer may place his name. List prices are better omitted from the circulars for two reasons. In the first place, in spite of discounts, the shipping charges and profits to intermediaries will often make the price to the native consumer higher than the factory list. No one likes to pay more than he expected for his goods. In the second place by leaving the price space blank the agent or dealer is able to fill in in ink the price he wishes to quote to the particular buyer in question, and where broadcasted without prices the interested reader must apply to the dealer thereby establishing contact.

Local space paid for by the dealer and manufacturer on a 50-50 basis is effective. It builds good will and molds sentiment in favor of large public service equipment, and brings direct sales for the less expensive and more widely distributed kinds of machinery and tools. Color plays its part still in Eastern lands and prejudice can be avoided by a consultation with the really informed parties when designs for labels are being worked up. The Department of Commerce in Washington is a mine of information for the exporter of metallic goods and repays an extended stay in the Capital, as does the Pan-American Union.

Europe Cannot Compete in Quality of Goods

Competition from abroad, especially Europe, is a matter to be kept under close observation. Agents will write frantic letters regarding the competition from Central Europe, letters that are apt to cast gloom over the American exporter until samples of the competitive article arrive. But once the actual piece is before the agent the reply giving counter arguments, encouragement and sales help is easy. The European article cannot complete in quality when it does in price. There is a market for dollar watches and for fifty dollar ones. The same is true of all lines and one group does not ever seriously infringe on another.

There is, however, another form of European competition, less obvious but more insidious. It is the indirect type. As often mentioned in export papers, one frequently meets even among our biggest houses, cases where the trouble is suddenly uncovered. The trouble consists of the granting of ageney or representation rights to a strong foreign house in a given territory where the lack of honor among the natives makes a native agent a doubtful proposition and where no strong American house is located. It is but natural that, having secured the agency for, say, an American line of pumping machinery, the agent should nevertheless turn over to a pumpmaker in his own country the bulk of pump business secured. This method of selling just enough to hold an agency and giving all the rest of his business to another house for a rebate can only be discovered, as a rule, during a tour by one of the home office staff. The remedy is obvious, of course, but prevention is better and may be secured by placing a minimum yearly sales figure in the agency contract (provided it is impossible to secure satisfactory American representation). At the same time the right to sell direct at all times, provided the commission on such sales is payable to the agent, should be reserved.

There is no better commission house service available to American exporters than that given by American

commission houses. The great English commission houses are wonderful merchants, but they are as a rule more successful in the merchandising of English goods than in merchandising those of other nationalities. This fact is especially true of machinery and hardware lines. The American commission house or salesman can better represent the product of his own country with the reputation of Yankee inventiveness, quality and finish behind him, than can an English firm who every time it talks up the American product is talking down that of Sheffield and Birmingham. This criticism is not a reflection on the English house; far from it. It is a simple statement of the factors of reputation, nationalism and human nature.

The ideal of the exporter is to develop a direct selling organization. In many cases this will never prove possible because of the various influences affecting the policy, in others the product may not lend itself profitably to individual effort specialized entirely upon itself. But as a whole it is better to strive for direct contact where it is possible. The removal of the opportunities for friction, delay, mistake and misunderstanding makes for more effective control and selling effort. Greater profits result also. But only in the case of very large organizations will profits come so much from the direct economies as from the reduction in misunderstandings.

The development of air tight technic, perfect service, courtesy, sympathy, and absolute fairness must come first. These qualities when secured, even though the business volume is small, will raise the exporter to a commanding position, where he can reach out in every direction. By offering necessary goods he will receive his share of the toll collectible from those who find it more expedient to purchase than to produce.

World Economic Situation for 1923

BY SECRETARY OF COMMERCE HERBERT HOOVER

The following summary of the world's economic situation and prospects is based upon the special investigation of the Department's representatives.

In the large view the world has made distinct economic progress during the past year and the conditions are very favorable to continued progress during 1923. There are in exception three or four states in Europe which give continued anxiety, but these exceptions should not obscure the profound forces of progress elsewhere over the whole world. In the main even in these areas of uncertainty the difficulties are to a large degree fiscal and political rather than commercial and industrial.

During the year the world generally has gained in social stability: Bolshevism has greatly diminished and even in Russia has been replaced by a mixture of socialism and individualism; at least active war has ceased for the first time since 1914; famine and distress have diminished to much less numbers this winter than at any time since the great war began; production has increased greatly during the past year; unemployment is less in world totals than at any time since the armistice; international commerce is increasing; the world is now pretty generally purchasing its commodities by the normal exchange of services and goods, a fact which in itself marks an enormous step in recovery from the strained movements of credit and gold.

In our country unemployment has ceased to be a problem and we are indeed upon an economic level of comparatively great comfort in every direction except for the lag of recovery in some branches of agriculture. Even in this field there has been a distinct improvement in prices in the past twelve months and its troubles are mostly due to overproduction in some lines. Our manufacturing industries are engaged well up to the available labor; industrial production has enormously icreased over last year; real wages and savings are at a high level. Our transportation and housing show great gains in construction, though we are yet behind in these equipments. Both our exports and our imports are again increasing after the great depression and are today far above prewar levels.

Outside of Europe the whole world has shaken itself free from the great after-war slump. The economic wounds of Asia, Africa, Latin America, and Australia from the war were more the sympathetic reaction from slump in the combatant states than direct injury. Their production and commerce have recovered to levels above prewar. The enforced isolation of many areas in Latin America and Asia during the war has strengthened their economic fiber by increased variety of production and has contributed vitally to their effective recovery.

In Europe, England and the old neutral nations are making steady progress in production and diminishing unemployment. Their trade and commerce are improving; their governmental finances are growing stronger; their currencies that are not already on a gold basis are steadily approaching par; and their exchanges are more stable. The combatant states on the Continent are slower in recovery. Even these nations, including Russia, have shown progress all along the line in commercial, industrial, and agricultural fields although the harvests suffered in some spots. Some of these nations such as Italy, Belgium, the Baltic States, Poland, Czechoslovakia, and Hungary show increasing political and social stability and improvement in their Governmental finances. In Germany and some minor states in southeastern Europe governmental finance and political difficulties threaten to overwhelm the commercial and industrial recuperation already made.

The continued maintenance of armies on a greater than prewar basis in the old Allied states maintains political uncertainty, lowers productivity, and retards the balancing of budgets with consequent cessation of direct or indirect inflation. Disarmament and the constructive settlement of German reparations and the economic relations of states in southeastern Europe are the outstanding problems of Europe, and their adjustment to some degree will affect the progress of the rest of the world. The more general realization during the past year of the growing menace of these situations and the fundamentals that underlie their solution is in itself some step toward progress. Their solution would mark the end of the most acutely destructive forces in the economic life of the world still surviving the war.

Economic forecast cannot amount to more than a review of tendencies and a hazard in the future. The odds are favorable for 1923; the world begins the year with greater economic strength than a year ago; production and trade are upon a larger and more substantial basis, with the single exception of the sore spot in Central Europe. The healing force of business and commerce has gained substantial ascendency over destructive political and social forces. There is ample reason why there should be continued progress.

A Noteworthy Experiment in Standardizing Railroad Motive Power

BY FRED H. COLVIN AND K. H. CONDIT
Editors, *American Machinist*

An outline of the standardization program on the D.T. & I. R.R. — Restoring bright work to attract the interest of the engine crew—Applications of automobile experience

IN THE STAFF series, "What's Wrong with the Railroad Shops?" just finished, a recommendation was made that steps be taken to standardize motive power and rolling stock. In view of the present situation on American railroads such standardization is going to be a long and tedious process and the sooner it is started the better. There seems to be no valid excuse for the hundreds of types of locomotives in use on some of our big systems.

It is not our idea that a locomotive, standard in every detail, can be developed to meet the requirements of all kinds of railroads. An attempt to produce such a locomotive would be met with entirely justified criticism on the ground that advancement and design would be killed. On the other hand there are many locomotive parts that can be made interchangeable with enormous resultant savings to the railroads and to the country. That such a proceeding is not visionary but on the contrary entirely practicable, is proven by the standardization work now in progress in the repair shops of the Detroit, Toledo and Ironton Railroad owned by Henry Ford.

When the Ford interests took over the road they got for their money a right-of-way, two streaks of rust and 80 locomotives of 17 different types, most of them in poor repair. Standardization was practically unknown except as to gage of track and type of coupler. As a result it was practically impossible to keep any kind of a stock of repair parts and when a locomotive came into the shop for overhauling new parts had to be made with the usual delay and expense.

As the success of Mr. Ford has been built upon standardization or interchangeable manufacture it is not surprising that one of his first moves was to apply these methods to his new venture.

The purpose of one of the first edicts to go out was to take advantage of the psychological effect on engine men and firemen of finishing certain parts which have formerly been "black with black stripes" in accordance with the usual custom in modern railroad practice. Instead of unfinished or semi-finished fittings which make a locomotive about as cheerful as a hearse and invite the men to let it get as dirty as possible, we see finished guides and rods, nickel-plated cylinder heads and polished and nickel-plated piping and valves in the cab. Of course, it requires more work to keep this nickel plate looking ship-shape but the result is that the men take the interest in their locomotives that was characteristic of the engine men of the previous generation when engines had names and reputations to uphold. Since the change was made there have been fewer accidents and the percentage of running repairs has been lower.

IT HAS long been our contention that one of the biggest forward steps the railroads could take would be the standardization of motive power, not as to complete locomotives but as to the parts that must be replaced most frequently. We said so in our recent series commenting on railroad shops in general. Here we offer proof that the thing can be done by telling how it is being done on the Detroit, Toledo & Ironton. The first fitting of an old locomotive with standardized parts such as vanadium steel side and main rods, crankpins and hub liners, bronze box liners and steel and plate glass cabs is an expensive job. But the returns will begin to come in when the time between overhaulings increases, the time in the shop decreases and the multiplicity of spare parts is reduced to a small fraction of its present size.

A further evidence of the endeavor to secure the co-operation of the engine crew is seen in the design of the two standard cabs, one or the other of which can be applied to any type of locomotive in use on the road. The cabs are made of ⅜-in. steel plates, and are floored with corrugated aluminum plates ⅛ in. thick over 2-in. oak flooring. The windows are all of ⅜-in. plate glass. Those in the front doors are of the adjustable ventilating type and the two large ones one each side of the cab are arranged in bronze grooves so that they can be opened full length.

The chairs for both engineer and fireman are of polished cast aluminum upholstered in Morocco leather and the comfort of the crew is further provided for by foot warmers consisting of aluminum grates over steam coils. The cab curtains are of the standard vestibule type.

A standard arrangement of cab piping has been worked out for all cabs, special attention being given to the accessibility of the valves for repairs. Injectors and steam and water gages are located so as to be most convenient for the enginemen. The steam turret with its fittings and connections is standard for all engines.

Standard running boards made up of ¾-in. steel plate about 18 in. wide and bound by ¼ x 2 x 2-in. tees have been designed. They are placed on a level with the engineer's floor of the cab and are designed without offsets or obstructions. The cylinder and steam chest casings are made of cast bronze and are polished and nickel-plated. A single design of steel pilot fits any class of locomotive.

Two standard headlights have been designed, one for the smaller locomotives to sit on top of the smoke box and one for the larger locomotives to be fastened to the front of the smoke box door. They are made of cast iron and are fitted with glass reflectors 18 in. in diameter which throw a beam of light 800 to 1,000 ft. ahead of the locomotive. One standard marker light fits all locomotives. It is made of cast iron and fitted with a revolving center in which are located white and green lenses for showing the class of trains.

Hardened Steel Hub Liners

Two classes of smoke boxes have been designed, one for the locomotives using saturated steam, the other for those equipped with superheaters. In design they conform to the Master Mechanic Standard being fitted with screens of No. 8 gage ½ in. mesh steel wire. The same cast iron boiler front end and front end door fits all locomotives.

Driving wheels and engine truck wheels are fitted with vanadium alloy steel hub liners which are hardened and ground. We shall have more to say about them in a later article. The driving box and engine truck box liners are made of special bronze and when used in connection with the hardened and ground steel hub liners give very good service according to the shop superintendent.

All side rods are of the channel type with solid bushings. They are made of specially treated alloy steel forgings and there have been no breakages since they were installed. Main rods are also of the channel type the butt and stub ends being of standard design for all classes of locomotives in order to make the parts interchangeable. The stub ends are fitted with tapered wedge bolts and blocks adjustable from the outside. The butt ends are of the open jaw type adjustable by means of wedge bolt and block.

Engine tenders being considerably less complicated in design than locomotives lend themselves to a greater degree of standardization. On the D. T. & I. R.R. they are divided into three classes, Class I having a capacity of 4,000 gallons of water and 7 tons of coal, Class 2 carrying 5,000 gallons of water and 8 tons of coal and Class 3 carrying 8,000 gallons of water and 15 tons of coal. The three classes have been so designed that some one of the three can be used with any type of locomotive on the line. In appearance and general design they are alike, the only differences being in size and strength.

The coal gates are of standard design and are made of ⅜-in. steel plates. They are held closed by the pressure of coal on the inside and are opened by pressing in on them from the outside when the coal has fallen low enough to require their use. No latches are therefore required to hold them closed.

A special design of tank valve is standard for all classes of tanks. Hose and hose connections between engine and tender are also standard for all types. Two types of chafing blocks are used, passenger and small freight locomotives being fitted with coil spring bumpers and chafing blocks while heavy freight locomotives are equipped with adjustable wedge blocks. The two designs take care of all locomotives on the road.

Uncoupling arrangements are standard for all the three tenders and so are the tender steps which are equipped with special safety threads to prevent accidents from slipping.

The tender trucks are made up of standard Andrews cast steel side frames and truck bolsters. Class 1 trucks are equipped with double elliptic springs 4½ in. wide with nine leaves of ⅜-in. spring steel and are used in connection with side frames with 5 x 9-in. journals.

The only difference in the springs used on Class 2 tenders is that the leaves are 5 in. wide instead of 4½ in. Class 3 trucks have triple elliptic springs 4½ in. wide with nine leaves of ⅜-in. spring steel and are used in connection with side frames with 5½ x 10-in. journals. It will be noted that only two classes of side frame are used, one for the heavy tenders and the other for both of the lighter types. The frames are made up of standard channels and angles and are fitted with cast steel draw gear castings of special design. The tank sills are of cast steel front and rear.

One of the greatest difficulties encountered with the equipment as it was taken over was with spring breakage. In desperation the new owners of the railroad turned the spring problem over to their spring engineers and developed a standard type of spring made up of the kind of steel used in automobile springs. The new springs were made in the Ford shops and not one of them has broken in service up to date.

In order to put through such a standardization program it was thought necessary to have on the job men who were familiar with the practice of shops where standardization is the rule and not the exception. As a consequence very few of the men in authority in the D. T. & I. R.R. shops were trained in railroad shops, most of them coming over from the Ford factory. They have an immense advantage over their brothers in other railroad repair shops in that they have been given a shop equipped with the most modern machines to be had. They are not hampered by an experience which has consisted largely of the ingenious development and use of makeshifts and the employment of inadequate machinery and tools. On the contrary, they are familiar with the most advanced practice in automobile production shops and with the capacities and speeds of machines and cutters.

Giving Men Pride in Engines

It is obvious that the first overhauling of a locomotive in the D. T. & I. shop is far more expensive than it would be under the old system but in the long run it is equally certain that a considerable saving will result not only from the reduced cost of making repairs and the shorter time the locomotive is out of service but also from the much longer time it can remain in service between overhaulings.

Perhaps the Ford management has gone too far in the matter of polished fittings and almost luxurious cab appointments. Time alone can tell. At any rate the refinements give the engineer and fireman a sense of pride in their locomotive which they could never have in the sombre, and often dirty, engine in use on most roads. In the matter of standardization of parts, however, the owners of the D. T. & I. are most certainly on the right track and their example might well be followed by other railroad managements.

French Industrial Reconstruction and How It Has Been Accomplished

By ARTHUR L. GREENE and HENRY OBERMEYER

Assistance rendered a Lille machine company—Its production nearly normal—Its part in reconstructing other industries—Optimism prevails in northern France

DURING THESE times of economic and political controversy, now being waged ever more furiously in France and centering for the most part around the reparation question, the visitor eventually asks: "What is actually being done in the way of reviving the war ridden industries of the country and just how has the average industrial affected a return of conditions to somewhere near normal?" It was with the idea of answering this question and of securing a personal perspective of the situation, that the writers paid a visit to the plant of the company de Fives-Lille, situated just outside of the city of Lille. Without doubt this is one of the largest and most important machine and structural engineering factories in France.

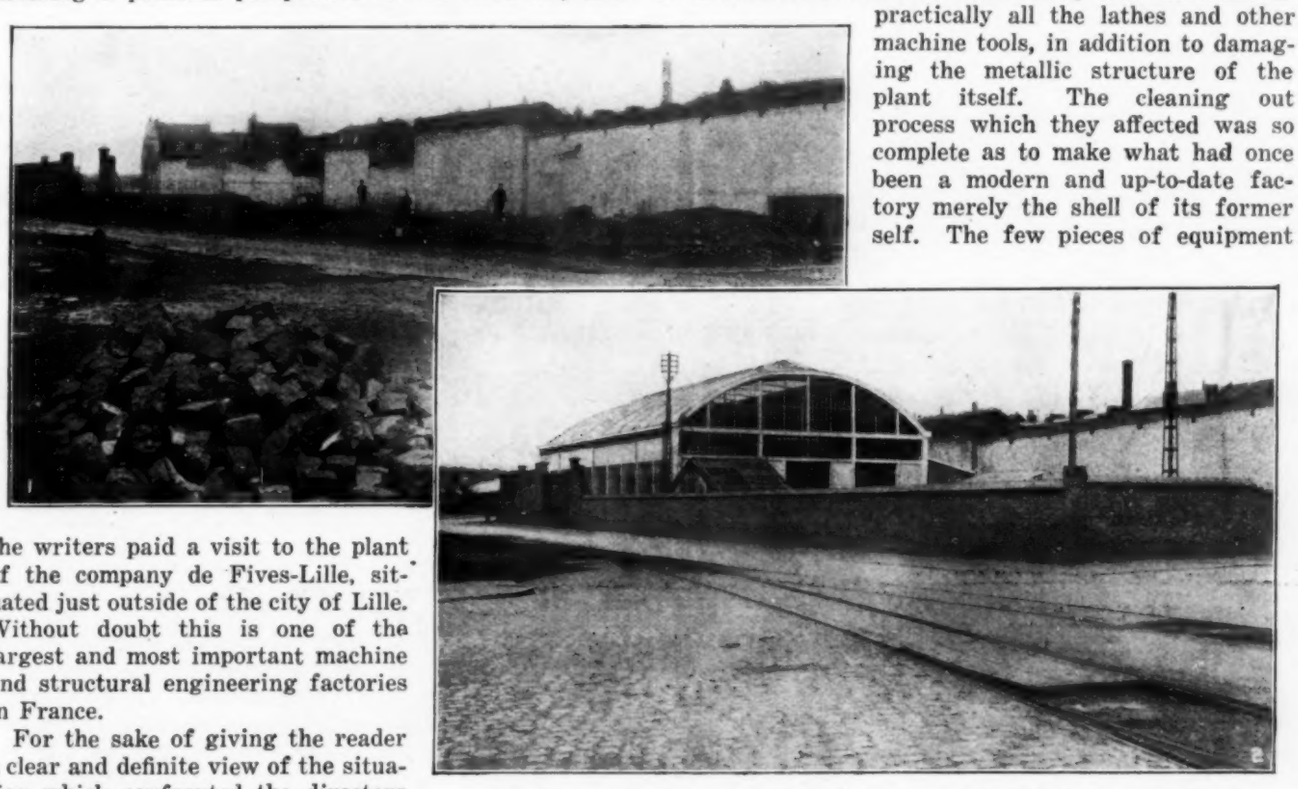


FIG. 1—A SHOP IN DECEMBER, 1918, AFTER GERMAN OCCUPATION
FIG. 2—SAME SHOP IN MAY, 1919, AFTER RECONSTRUCTION

For the sake of giving the reader a clear and definite view of the situation which confronted the directors of this company at the conclusion of the war in the summer of 1918, it might be well to give a short history of the plant during the years 1914 to 1918. The world conflict is of too recent memory, perhaps, to have to recall to mind the fact that the city of Lille was one of the first French cities captured by the Germans in their rush across the border from Belgium and that in addition it was occupied by the Germans throughout the war until the day previous to the signing of the Armistice. It constituted the base of all their activities in northern France. During these four years or more of German occupation, the factory of Fives-Lille was one of the main repair shops of the invading army and its entire equipment of machines, tools and cranes were in active and constant use for the whole of this time.

In just what condition the Germans left the plant, and to what extent the work of reparation has advanced, the reader can get a fairly good idea of from the views in Figs. 1, 2, 3 and 4. Of first consequence in the work of destruction, was the removal by the Germans of practically all the lathes and other machine tools, in addition to damaging the metallic structure of the plant itself. The cleaning out process which they affected was so complete as to make what had once been a modern and up-to-date factory merely the shell of its former self. The few pieces of equipment left behind were so badly out of commission that they were worth less than the space they occupied and weren't even worth the cost of transportation to Germany. Here was a factory spread out over some 250 acres of ground, at one time fully equipped in every direction with modern machinery and then thrown back into the hands of the French with only the empty hulls of some of the buildings left to denote what had once been a thriving industry.

The situation was possibly bad enough, even for a country such as ours with all of its potential wealth intact and its countryside unravaged by war. But take into consideration the fact that France depended almost entirely on the reparation payments from Germany, as stipulated in the Treaty of Versailles, to pay for the reconstruction of these devastated regions and factories; and then add to that the fact that only a very small fractional part of the total has been paid and one begins to get an adequate idea of the progress the French industrials have accomplished during the past three years in restoring their industries to their present condition. The situation of Fives-Lille is by no means exceptional. The company is but one of a great many that suffered the same proportion of destruction and are now beginning to operate under something like prewar conditions.

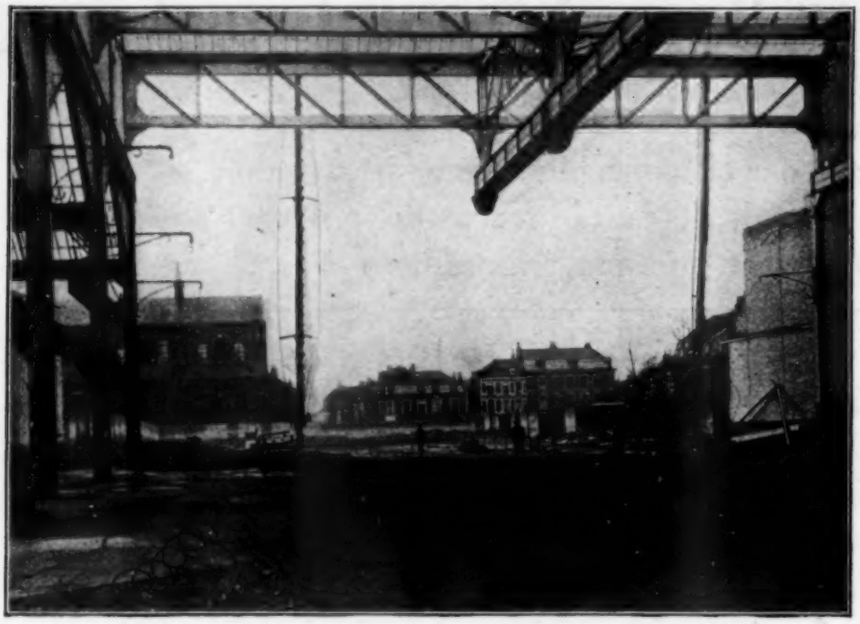


FIG. 3—INTERIOR OF ANOTHER SHOP IN DECEMBER, 1918, AFTER GERMAN OCCUPATION

This machine and structural engineering factory at Lille is today, for all practical purposes one and the same, as far as equipment and efficiency are concerned, as it was at the beginning of the war in August, 1914. Visit any part of its numerous buildings and you will find every one a beehive of industry, every nook and corner fully equipped with all the most modern and efficient machinery and each machine working at full time in the production of the product for which it was built. Try and classify the kind of products and you will find this factory engaged in the production of every conceivable kind of railroad rolling stock, including some of the most modern and largest locomotives, electric cranes, beet and cane sugar machinery, mining equipment, steam turbines, distilling machines, electrical equipment of all kinds, steam boilers of all descriptions, forges and structural steel equipment with all its many accessories.

Inquire the number of employees now engaged and you will find that there are approximately 3,200 factory hands at work in the factory, not including a clerical and engineering staff of some 700 men and women. Then take into consideration the fact that in normal times there were only about 5,000 people employed all told and you will realize the strides that have been made in a return to normalcy.

The question naturally arises at this point: "Just how has it been done?" It was a question that occurred to us and the answer to it as given us by M. Alphonse Garnier, director of the company, resolved itself into three parts, the first aid rendered by the company itself, the belated help and patronage extended it by the French government, and the moral spur given the company by the realization that the northern part of France, in which this factory is situated, was as depleted of productive facilities as any one section could possibly be after having been the battle ground of contending armies for more than four years, and that now or never was the time for the resurrection of productive genius.

In considering the first point mentioned in particular, one might ask, "How could this company extend itself aid under the circumstances?" Perhaps under ordinary conditions it could not have done so, but it so happened that the company of Fives-Lille owned another plant at Givors, near Lyons in the southern part of France, and this plant was immediately enlarged at the opening of hostilities to make munitions of war. Within a short space of time the plant grew to tremendous proportions and employed a staff of more than 7,000 men.

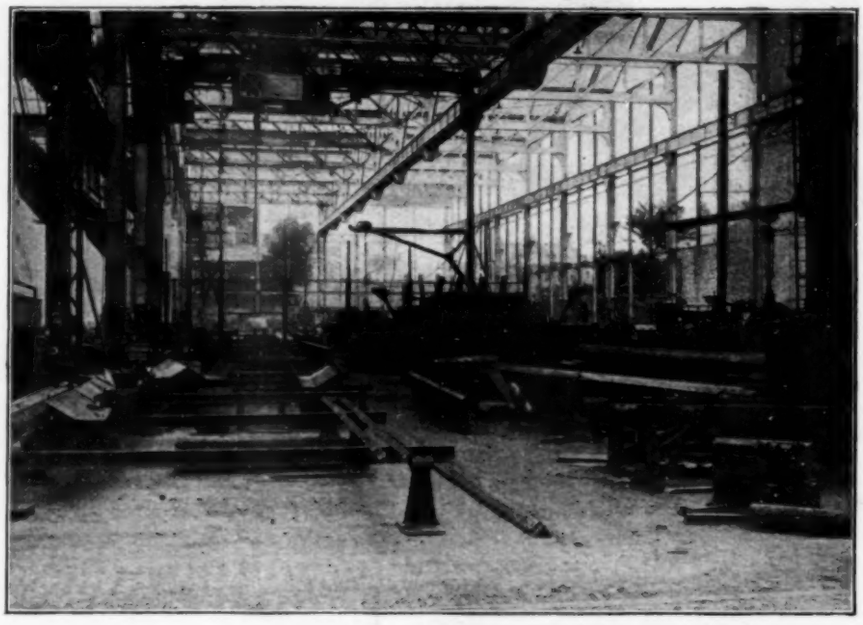


FIG. 4—SAME SHOP IN JULY, 1919

First of all the company gave the French government at a time when they needed it most, a machine, locomotive and structural engineering factory, the entire output of which was devoted to the exigencies of war.

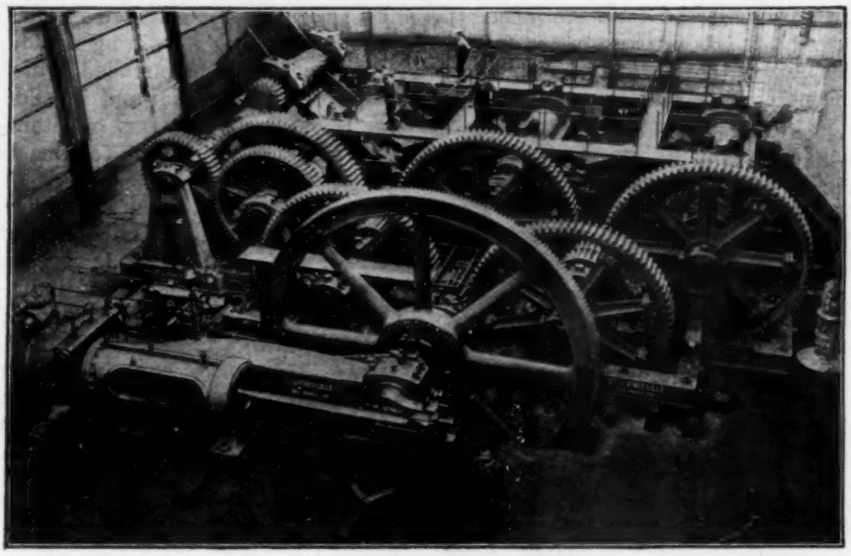


FIG. 5—SUGAR EXTRACTING MACHINE

But the after-effects of the foresight displayed by the directors of the company in extending the facilities of the plant were perhaps even more important, at least from the viewpoint of restoring the industries of the devastated regions. The company of Fives-Lille was thus able to maintain its skilled engineering and drafting force intact, and what is even more important, it secured the financial nucleus with which to begin the reconstruction work on its larger and more important factory at Lille.

With respect to the help extended the industries in the devastated regions by the French government, it is interesting to note that within the past three years, the government has extended in currency and extended credit in this direction to the total of some one hundred milliard francs. What this statement really means is that the French government has loaned that amount to the German republic. According to the terms of the peace treaty, the German government assumed the responsibility of restoring the industries of the country to their pre-war condition. It is safe to say, however, that if the French industrials had waited upon the help actually given them by their late opponents, the sections which formerly constituted the battle ground of the armies would today look quite as barren and unproductive as they did during the years 1914 and 1918. The extension of these credits to their own industries has laid a tremendous tax burden on the people of France and it is perhaps only after a visit to these regions, where one can see the actual damage inflicted, that one gets a very comprehensive idea of the almost insurmountable difficulties that have surrounded the work of reconstruction.

Aside from the very grave financial difficulties in the way of reconstruction, there was the added difficulty of securing labor. In the city of Lille alone there were more than three thousand homes completely destroyed in addition to those partly damaged. This condition created a tremendous housing shortage which even to this day has only been but partially remedied. This condition existed in spite of the fact that the reconstruction of housing facilities was the first step initiated by the government, after the war in order to bring the refugees, who had fled before the German invasion, back to their original home sites. The company of Fives-Lille, however, again showed its foresight in this matter by undertaking the rebuilding of the homes of its workers at its own expense. In this way it gained a tremendous advantage over some of its fellow industries who waited upon the more tardy assistance of the government.

In passing through the devastated regions of northern France, one finds entire villages rebuilt in which there is no trace left of the homes that once occupied the same sites. One will find the houses built of red brick with an eye to durability, and very similar in structure and design to many of our suburban homes. In fact, this section of France looks like nothing so much as some of our own little towns and hamlets on the outskirts of the larger cities. It is quite the most unique contrast that one can find between old and new France.

In determining the amount of financial assistance to be given private industrials in helping them to restore their plants, the French government extended aid in proportionate measure to the amount of damage inflicted. Government experts visited each one of the factories applying for help and after due inventory, they submitted figures showing the amount of damage that each factory had suffered in the war. In due course of time the factories were extended credit by

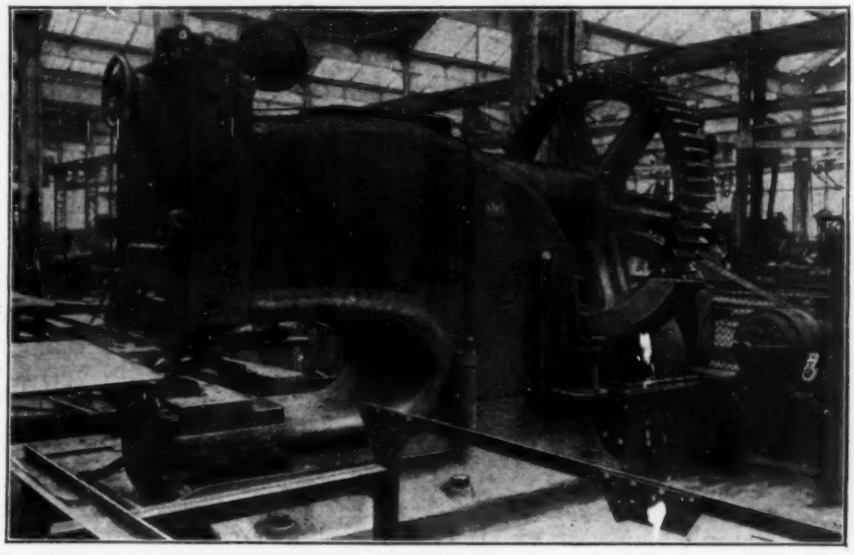


FIG. 6—PUNCHING MACHINE FOR CUTTING AND STAMPING SHEET IRON PLATES

the government, averaging from 25 to 30 per cent of the total loss suffered. In the case of the company of Fives-Lille, the entire cost of reconstruction was more than 150 million francs.

It is perhaps incorrect, in one sense, to speak of the credit advanced by the government to private individuals as a loan. The government has advanced this credit on the presumption that it will some day be paid back the equivalent amount by the German Republic itself, either in actual currency or in products. As events have proved, however, it is more of a gambling chance than the French government had originally contemplated. Even if all the reparation payments are not finally made, however, the industrials who have received this government aid are not required, except morally, to return the amounts advanced.

For a period of twelve months following the signing of the Armistice, the company of Fives-Lille was engaged solely in restoring its buildings, many of which had been destroyed, and in installing new machinery. This latter phase was the one which required the most time. In addition to making free use of the plant and its equipment the Germans took advantage of their temporary occupancy to take the originals of some of the machines which were exclusively of French design and pattern and remove them to the interior of their own country. Many of these machines were later found in use at the Krupp and other works of Germany. They were, of course, returned after the war, but for the most part were found to be utterly useless for any practical manufacturing purposes.

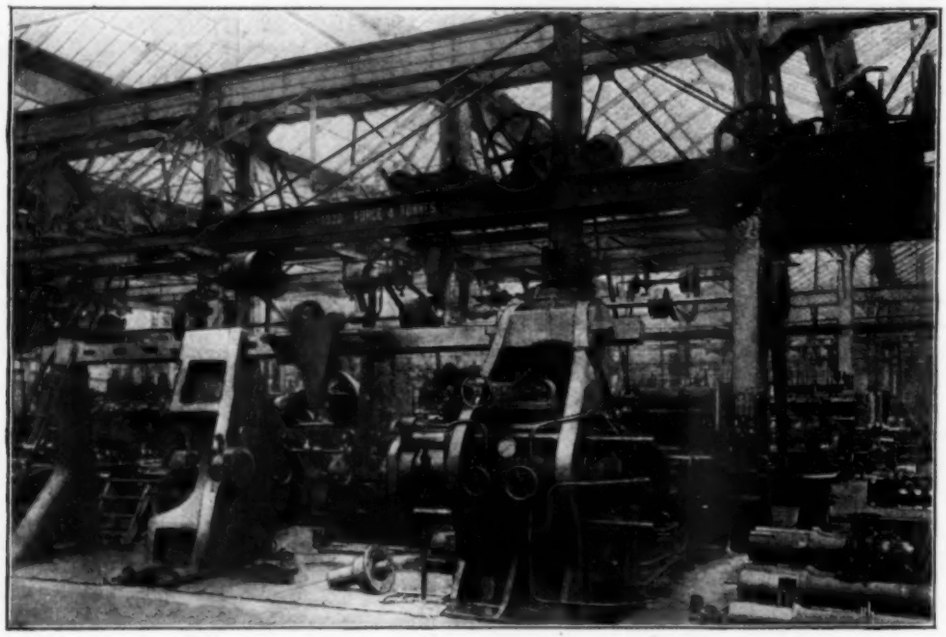


FIG. 7—HYDRAULIC PRESS USED FOR LOCOMOTIVE WHEELS AND 6-TON CRANE

It was interesting to note on a tour through the factory that although many of the machines used in the factory prior to the war were of German manufacture, the immense equipment of machines installed during the past three years has been practically of French, English or American manufacture. This instance is but one of many which might be cited, to show the enormous trade which Germany has lost in the industrial field of France because of the war.

Today we find not only the plant fully equipped with all the machinery necessary for full-time production, but we also find the factory buildings fully reconstructed with modern methods of lighting and sanitation installed throughout. There is a new administration building twice its former size and an engineering and clerical force greatly increased for intensified production to restore the other industries of the devastated regions. In the basement of the administration building a modern printing plant has recently been installed which takes care of the printing of new designs and in addition prints all the catalogs and other forms of literature which the company sends out from time to time to those interested.

In connection with the restoration of other industries, the present condition of the beet sugar industries of France is an example worth noting. Lille, as is perhaps well-known, is in the very heart of the beet sugar industry of the country and practically all of the beet sugar is grown and manufactured within a radius of 100 miles of that city. In August, 1914, there were in France some 240 beet sugar manufacturing plants. Today there are only ninety. On account of the very essential part which this industry plays in the economic life of the country, principally because of the great number of people engaged in the growing of beets and the large forces formerly employed in the beet sugar manufacturing factories in the vicinity of Lille, the rejuvenation of this industry was one of the first to occupy the attention of both the government and the private industries.

It was at this point that the important rôle to be played by the company of Fives-Lille in the reconstruction game becomes most apparent. Previous to the war, this company ranked among the foremost in the manufacture of beet and cane sugar machinery. Its reputation was international. In Cuba during 1910 and 1912, it constructed two of the largest cane sugar factories ever built there. It not only supplied the machinery, but also erected and supplied from its own shops every piece of steel that went into the making of it. In short, this company was and is, not only a manufacturer of beet and cane sugar machinery, but it is also a specialist in the construction of the factories themselves.

The war of course put an effectual end to the production of sugar manufacturing machinery and in addition it destroyed a large proportion of the factories. The old saying "that it is an ill wind that blows nobody some good" might be aptly used at this point to illustrate a situation in the beet sugar industry which has been a veritable boom for the company of Fives-Lille. This company has been devoting a considerable part of the productive capacities of its plant, the past year in particular, to turning out the various kinds of machinery needed in the manufacture of beet sugar. Even with its present extended facilities for production, however, its maximum output is the building and complete outfitting of some three or four plants a year.

At such a rate it might be supposed that the sugar producing industry of France would take many years to get back to normal. Fortunately for the country, however, this was not the case. The war has taught many things and its destructive effect therefore has not been without its compensating lessons. For one thing it has taught the economy of time and capital to be derived from mass production and unified effort. For this reason it is not expected that all of the beet sugar factories destroyed during the war will be rebuilt. In many instances, where geographical conditions have allowed, two, three or even four beet sugar producers and manufacturers have combined their output, and for manufacturing purposes are building one plant which will take care of the combined output of all. In addition to the saving in the reconstruction, these combinations have also made possible the introduction of more labor saving machines and better systems of production.

Sugar Extracting Machines Developed

At this point it may be of interest to note several of the more recently improved beet sugar machines developed by the company of Fives-Lilles since the war. First in importance is a sugar extracting machine, known as a crusher which is shown in Fig. 5. This machine is run by a corliss engine and is made with three containers of three cylinders each, the dimension of each container being 915 by 2,140 mm. The overall dimensions of the crusher are 863 by 2,140 mm. This company also makes a larger sugar extracting machine which has four containers, each with a dimension of 760 by 1,530 mm., and driven by a corliss engine of 580 by 1,100 mm. Since the war, the company of Fives-Lille has also started the manufacture of an improved pressing block sugar machine, a sugar filtering machine with exterior demountable plates and a new type of boiler used for the cooking of the cane sugar.

Thirty New Types of Machines Developed

To revert for a moment to some of the other accomplishments of the Fives-Lille Co. since the war, it has within the past three years developed about thirty new types of machine tools of various kinds, including a new type of punching machine and a 500 ton locomotive wheel press. The punching machine shown in Fig. 6 is employed to stamp and cut sheet iron plates. It has a power of 125 tons and is able to penetrate a maximum thickness of 40 mm. in sheet iron. The drill opening of the machine is 1,250 mm. It is run by an electric motor of 15 hp., maintaining 960 r.p.m. The machine itself is mounted upon a movable bed. For punching and cutting plates of great thickness, the movable bed is operated by a hand lever and the plate to be stamped is placed in front of the machine and immediately before the operator. For plates of lesser thickness the machine is operated by a foot lever. The direction of the cutting is controlled by flywheel worked by the operator.

A similar punching and cutting machine is used for stamping out side plates used in locomotive construction work. It has, however, a much longer movable bedplate which slides in a transverse groove mounted upon a base perpendicular to the main carriage.

Another machine manufactured by the company of Fives-Lille and in wide use in locomotive factories in France, is a hydraulic press shown in Fig. 7. It is employed in forcing the wheels of locomotives on the axle bearings. This hydraulic press has a pressure of 350 tons, with a piston diameter of 425 mm. The press is operated by a hydraulic pump of three stages and the pressure can readily be raised or lowered depending on the amount needed. The entire hydraulic press is attached to a 6 ton electric crane also shown in Fig. 7 at the top. In addition to the beet sugar machinery, stamping machines and hydraulic press mentioned, this company has also recently manufactured and constructed a great number of dock cranes and coal mining machinery. One of its dock cranes now in use at Brest, France, has a lifting power of 75 tons, with a 360-deg. angle of rotation. This company also supplies most of the mining machinery for the coal mines of Lens.

The locomotive shops of the company are now working about 50 per cent of normal. This is in the main due to the slump which has taken place in that industry throughout the country. Manufacturers believe that even this ratio will be decreased in the near future. The normal production of locomotives in the company of Fives-Lille is about twenty large ones per month.

One of the transportation systems which has been erected in the yards of the company since the reconstruction program has been initiated, is an overhead trolley system. The hangers are constructed entirely of concrete and the carriage is some 50 ft. above the ground. The system is one of the newest introduced in the country and gives rapid transportation.

Help from Germany in Trade Agreements

Despite the economic ills which have flooded the country since the close of the war, the industrials in the devastated regions of northern France are optimistic. This view of the situation has been secured because, practically through their own unaided efforts, they have been able to gain the upper hand of a situation that at first glance looked like an impasse. And now, when the worst of the situation has been met and overcome, it seems likely that there will be help forthcoming from Germany as a direct result of some trade agreements recently signed between French and German industrials.

We have as proof of this the Lubersac-Stinnes agreement and the contract signed by the Gallieni group with the Wurtemberg Raw Material Co. for reconstruction building material. An even more recent agreement is that between the French Chambre Syndicale des Constructeurs en Ciment Armé with the Lehrer Von Siemens United Building Materials Co. All these agreements provide for a working basis on which to reconstruct the destroyed villages and industries of France. It is also noteworthy as signalizing the resumption of better trade relations with their old enemy, that for the first time, the French propose to admit direct labor by German workers in France. Previous to this agreement the French have consistently refused such offers on the part of German workers. Through these various agreements it is now provided that 40,000 German workers will be employed in the devastated regions of France. As a direct result of the pacts already signed, it is expected that the coming year will witness many more agreements of a similar nature.

Business prophets may be able to prove that the industries of France are in a bad way, but a visit to the northern part of the country, where most of the national industries are situated, will show that very real strides have been made in a return to conditions as they existed in 1914 and that within the next few years, the phrase "devastated regions" will become a phrase relegated to history books and not to the present-day discussions of conditions as found in France.

TABLE XVI

Japan—Imports of Metal and Woodworking Machinery

Country	*1909 **Yen	*1910 Yen	*1911 Yen	1912 ***Kin	1912 Yen	1913 Kin	1913 Yen	1914 Kin	1914 Yen	1915 Kin	1915 Yen
Kwantung Province	.....	.....	.....	.....	.....	.....	.....	1,631	687	2,082	1,747
Asiatic Russia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Great Britain	2,136,337	597,562	531,099	8,528,611	2,243,818	6,309,155	1,894,926	5,435,783	1,673,848	891,437	278,652
France	.....	.....	.....	6,904	2,519	10,495	4,349	5,080	4,257	120	561
Germany	31,513	68,876	70,947	1,424,375	611,800	1,804,259	549,037	1,173,097	335,895	501,268	125,692
Belgium	.....	.....	.....	225,580	59,272	147,828	42,067	8,469	3,742	.....	.....
Italy	.....	.....	.....	.....	.....	.....	.....	36	36	.....	.....
Switzerland	.....	.....	.....	50	298	365	1,513	51	203	263	1,181
Austria-Hungary	724	10,493	6,624	17,087	3,666	.....	.....	.....	.....	.....	.....
Holland	.....	.....	.....	.....	.....	13	7	.....	.....	.....	.....
Sweden	.....	.....	.....	4,901	2,175	6,370	4,202	43	31	.....	.....
Denmark	.....	.....	.....	1,685	378	.....	.....	.....	.....	.....	.....
United States of America	125,809	145,200	354,760	2,389,274	1,042,495	1,672,626	782,925	1,068,623	461,916	994,801	483,085
Canada	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Unknown and Other Countries	1,235	1,459	656	.....	.....	.....	.....	132	13	.....	.....
Totals	2,295,618	823,590	964,086	12,598,467	3,966,421	9,951,111	3,279,026	7,692,945	2,480,628	2,389,971	890,918

Country	1916 Kin	1916 Yen	1917 Kin	1917 Yen	1918 Kin	1918 Yen	1919 Kin	1919 Yen	1920 Kin	1920 Yen
Kwantung Province	19,505	6,296	104,416	41,957	203,349	63,447	91,500	46,000	2,800	1,000
Asiatic Russia	.....	.....	.....	.....	4,233	2,054	3,600	1,000	.....	.....
Great Britain	317,947	134,013	1,107,0[illegible]5	408,600	433,726	251,038	625,900	484,000	3,443,900	2,573,000
France	11,252	5,573	182	1,155	.....	.....	7,500	9,000	8,400	8,000
Germany	12,267	4,643	274	220	.....	.....	.....	.....	50,900	60,000
Belgium	.....	.....	.....	.....	.....	.....	.....	.....	400	4,000
Italy	.....	.....	.....	.....	.....	.....	33,700	40,000	.....	.....
Switzerland	6,279	7,461	2,782	1,409	1,279	1,582	100	1,000	1,800	5,000
Austria-Hungary	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Holland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sweden	3,666	3,377	.....	.....	4,606	10,163	4,300	9,000	23,400	31,000
Denmark	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States of America	2,826,469	1,622,051	5,008,888	2,995,334	8,186,684	6,281,862	9,483,700	9,973,000	10,944,900	10,964,000
Canada	.....	.....	.....	.....	13,736	10,062	.....	.....	.....	.....
Unknown and Other Countries	.....	.....	15,947	3,508	52,374	21,585	.....	.....	.....	.....
Totals	3,197,385	1,783,414	6,239,534	3,452,183	8,899,987	6,641,793	10,250,300	10,563,000	14,476,500	13,646,000

Note.—Classified in 1909, 1910 and 1911 as "Drilling and Boring Machines" and "Turning Lathes."
*Quantity not shown prior to 1912.
**Value of yen at parity is 49.85c.
*** Kin = 1⅓ lbs.

Oscillations and Fatigue of Springs

BY JOSEPH KAYE WOOD
Engineer Western Electric Co., Inc., and A. T. & T. Co.

The second article—Period equations for springs without attached weight—Values for helical and flexural springs—A general period formula

IN THE FIRST section of this article, published on page 67 of *American Machinist*, the general formula for the period of oscillation was derived under the assumption that a constant load was secured to the end of the spring and that the mass of the spring was relatively small enough to be neglected. The formula is as follows:

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\frac{K^2WF}{P}} = \frac{2\pi}{\sqrt{g}} \sqrt{K^2W \times l.d.r.} \qquad (7)$$

where $F \div P = l.d.r.$, the load-deflection rate of the spring, K is the gyration factor, and W equals the weight of the attached mass. When the spring is in static equilibrium, $P=W$, and if $K=1$, the formula may be written:

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{F_w}$$

where F_w is the deflection produced by the weight W. As would be expected, this period equation is similar to the period equation for a simple pendulum, because the wave characteristics and the mass of the spring have been neglected.

Now the question arises: What is the period of oscillation for a spring, vibrating without any attached weight? Before a general formula can be developed in answer to this question, the two factors referred to in the previous article, which take into account the mass of the spring and the various modes of wave

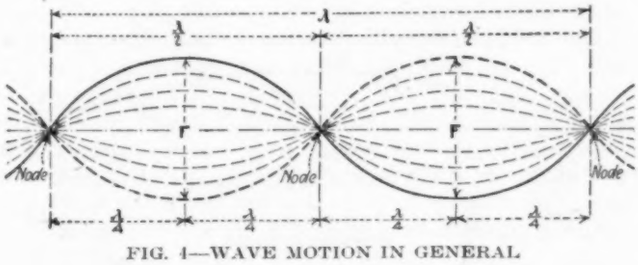


FIG. 4—WAVE MOTION IN GENERAL

formation, must be determined separately for springs of the helical, flat and spiral forms.

Only the final expression for the period of oscillation for each of these spring forms will be given, because no particular advantage would be obtained by displaying the pure mathematics, which in these cases is very long and complex. However, sufficient explanations of the various terms appearing in these formulas will be given in order that the formulas may be comprehended for practical use. Many of the characteristics of a wave motion are common to all spring forms and hence a general discussion of them and some definitions, will be given before actually taking up each form separately.

As stated in the previous article, an oscillation is a forward and backward motion of a single particle, as for example, the particle on the extreme or free end of a spring. It is also a similar motion of a body, all particles of which move together through equal displacements, as for example, the attached weight on the free end of a spring. A translating motion of an oscillation at right angles to its path constitutes a wave motion path in which the single particle travels. An actual wave motion is, in the case of an elastic solid, the transference of an oscillatory motion from particle to particle, and the maximum displacement or amplitude of each preceding particle is slightly greater or less than that of the one following it.

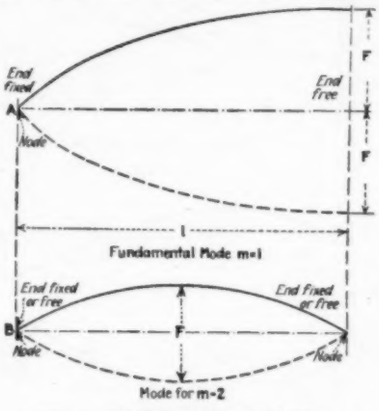


FIG. 5—WAVE MOTION FOR A HELICAL SPRING

For flexural springs the paths of oscillation for every particle are at right angles to the direction of the wave propagation, and hence are called the wave of transverse oscillations or vibrations. In the case of helical springs, the paths of oscillation are coincident with the direction of wave propagation and hence are called waves of longitudinal oscillations. Graphically, a wave motion of transverse oscillations is the locus of the extremities of the displacements at any instantaneous moment. For longitudinal oscillations, it is a similar locus, when the paths of these oscillations are considered as being turned through 90 degrees.

In Fig. 4 is shown a group of wave motion positions in dotted lines, intermediate between the position at the beginning of a period in a full line, and at the end of half a period in a broken line. The particles of a spring actually take the positions represented by the loci or wave forms. However, it is usually the practice, and it will be followed in this article, to show only the extreme positions because these are the loci of the extremities of the maximum displacements, in other words, the amplitudes, and the value of the maximum amplitude appears in the formulas.

The particles at n, n', n'' and so forth, called nodes, remain stationary during a wave motion because of the speed at which the transference of oscillations takes place, that is, the velocity of the propagation of a definite wave length. This length, which will be designated by the symbol λ, is the distance between alternate nodes. The velocity of wave propagation V_w is the speed at which these wave lengths travel, and numerically, is equal to λ divided by the period of oscillation T, because a complete wave of length λ is formed every time a complete oscillation of any particle in the spring occurs. We, therefore, have

$$V_w = \frac{\lambda}{T} = \lambda f \qquad (8)$$

where f equals the frequency or number of oscillations per second. In general, the value of V_w in an elastic medium is equal to: $\sqrt{\text{Modulus of Elasticity} \div \text{Density}}$.

The period of oscillation T for any one spring may vary, because the wave length and also the number of nodes may vary, depending upon the flexibility, damping characteristics and the manner in which the oscillations are started. The maximum wave length corresponding to the maximum period constitutes what is known as the fundamental or gravest mode of oscillation. As the wave length decreases, usually in even multiples of the fundamental, the number of nodes increases and for each additional node the mode of oscillation is said to be raised one stage higher.

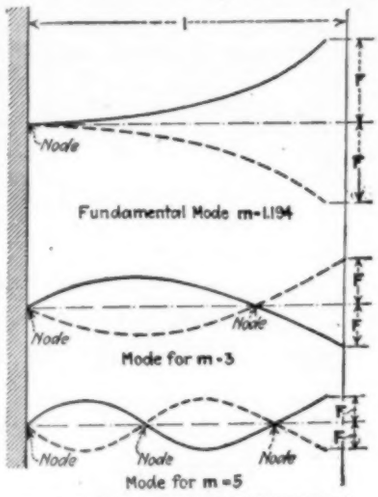


FIG. 6—WAVE MOTIONS FOR A CANTILEVER SPRING

The period of oscillation will be determined now for each spring form vibrating freely without any attached weight. These formulas will include two factors in addition to those in formula (7), the factor m whose different values correspond to the different modes, and factor s whose values show what fractional part of the spring's mass, if concentrated on the end of a theoretically weightless spring, would produce an equal period of oscillation. This equivalent mass, the purpose of which will be better understood later, also would produce an equal period if the amplitudes of all the particles were to be considered as having the same value. The former condition for s is approximated in the case of a heavy weight attached to the end of a light spring which formula (7) represents.

The factor m has the following relation to the wave length λ and the spring's length l:

$$\lambda = l \div \frac{m}{4};$$

and similarly for the factor s,

$$W = w \div s$$

where W is the equivalent weight and w is the weight of the spring.

The period of oscillation for a helical spring, not closely wound, and vibrating freely is as follows:

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\frac{(4)\,wF}{m^2(\pi^2)\,P}} \qquad (9)$$

where $\left(\frac{4}{\pi^2}\right)$ is the value of the factor s, $F \div P$ is the load-deflection rate (l.d.r.), w the weight of the spring and g the acceleration of gravity (32.2 ft. per second per second). The period T is in seconds.

As illustrated in Fig. 5 the factor m has different values according to the following conditions: As helical springs in mechanisms are relatively short, they must always oscillate in the lowest modes, hence for springs which are clamped at one end, as shown at A in Fig. 5, the lowest mode is the fundamental mode, for which mode the period of oscillation is given by formula (9), when $m = 1$. The single node of the quarter wave length, therefore, $l = \frac{1 \times \lambda}{4}$ is at the fixed end. For the higher modes of very long springs, m is equal to 3, 5, 7 and so forth, which figures are determined both by the pure mathematics and by experiment.

As shown at B in Fig. 5, when both ends of a helical spring are clamped or free, (a rare case for mechanisms) m for the different modes has values equal to 2, 4, 6, 8, and so forth, which are similarly determined. For example, a very long helical spring, having a large spring index and oscillating with both ends free, that is, by suspending the spring horizontally from the ends of cords at various points along the spring's length, can be made to give all the modes up to about the tenth, for m=2, 4, 6, 8 and 10. The different number of nodes are produced by holding the spring stationary at the proper points when starting the oscillations. Such a device, as we know, is used in university laboratories to teach the principles of wave motion in general. The period for the wave motions of this spring would not, however, be given by formula (9) due to the suspension which produces a pendulum effect. The correct formula is simply the summation of the pendulum length l (length of cords) and the factors in formula (9) under the radical sign:

$$\frac{2\pi}{\sqrt{g}} \sqrt{l + \frac{(4)\,w\,F}{m^2\,(\pi^2)\,P}}.$$

This formula was first derived by F. J. Rodgers of Stanford University.

The period of oscillation for a long flexural spring

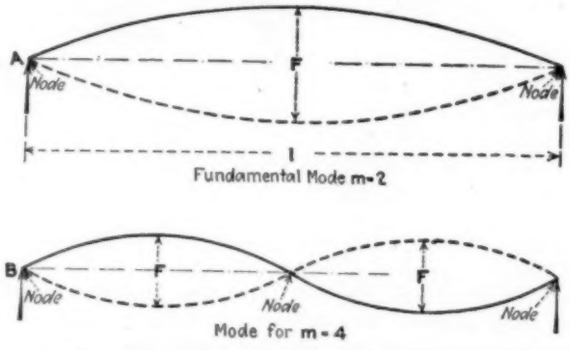


FIG. 7—BUFFER SPRING SUPPORTED ON ENDS

without any attached weight is equal to:

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\frac{16\,w\,l^3}{m^4\,\pi^4\,I\,E}} \qquad (10)$$

where I is the moment of inertia of the cross section,

E the modulus of elasticity (Young's), w the weight of the spring, l the length of the spring and m the mode factor. The factor s and the load-deflection rate will be introduced below with the values of the mode factor m for the different types of flexural springs.

The cantilever type of spring, as we know, has one end clamped and the other end free. The value of m for the fundamental mode is 1.194, and for the higher modes m has values equal to 3, 5, 7, and so on; but the fundamental mode is the most common for the cantilever spring particularly when it is short and heavy.

In Fig. 6 is shown the character of the wave motion, graphically, for the first two modes of oscillation. The fundamental mode has only one node which is at the clamped end while the second mode has an additional node at about one-third the distance from the free end. The relation between the wave-length and m is given in the beginning of this article.

There are many examples of vibrating flat springs of the cantilever type, in both manual and automatic telephone apparatus. Another example of the use of springs of this type is in the a.c. frequency meter where sized reeds respond to the different frequencies of current oscillations. Although each one of these springs or reeds is rated for its fundamental mode, it will respond to the higher modes of frequencies but with decreased amplitudes. In general, it is true that for an increasing number of nodes, that is, for the higher modes, the amplitudes decrease.

Mode Values for Buffer Type of Spring

For the buffer type of spring, the ends of which are supported like those of a simple beam, m has values equal to 2 for the fundamental mode and 4, 6, 8, 10 and so on, for the higher modes. If the ends are free, that is, overhanging the supports, m has values equal to 3, 5, 7, 9, and so on. In Fig. 7 are given the wave forms corresponding to some of the modes of a buffer spring. At A and B are shown the first and second modes for supported ends. Fig. 8 shows at A and B the first and second modes for free ends.

In Fig. 9 is represented the wave motion which takes place in a tuning fork. This wave form is simply that at A in Fig. 8, whose plane of equilibrium has been bent U-shaped and the nodes brought closer together. Experiment has shown that these nodes are brought closer and that the tones produced are those due to the oscillations of the free end parts, because the amplitude of the middle loop is so relatively small. The period of oscillation, therefore, for a tuning fork is determined with sufficient accuracy by considering the part from a free end to its adjacent node (one prong) as a spring of the cantilever type, the node being the clamped end. Then the values of m previously given for this type of spring can be used in formula (10) to calculate the period.

The higher modes are very difficult to obtain, fortunately, and when they are obtained, they are quickly dampened out while the fundamental tone persists for a considerable length of time. The fundamental tone persists because of the small dampening in steel and the large mass, while the overtones of the higher modes die out quickly because their amplitudes are so extremely small in this type of spring. The value of m, therefore, is 1.194 when formula (10) is applied to the tuning fork. On account of its pure, persisting tone, the tuning fork is used to calibrate other audible tones in electrical and musical instruments. The wave loop between the nodes is useful when the fork is mounted on a resonating box, because then the fork transmits longitudinal oscillations through the stem to the box, with the result that the tone of the tuning fork is greatly amplified by the wave motion set up in the large mass of air constrained within the box.

With both the spiral and coiled types of springs, particularly with the former, there usually is attached to the end, a relatively large weight, or balance wheel, in such a way that it gyrates about the axis of the spring. In this case the formula derived in the previous article, in which the weight of the spring is neglected, can be used with sufficient accuracy to calculate the period of oscillation. Now the periods for spiral and coiled springs , not having any attached weight, can be calculated from formula (10) in which values of m corresponding to the higher modes of oscillation for the cantilever type of spring, are used. However, the difficulty of knowing just what value of m to use in this case makes it more advisable to determine the period by experiment rather than by calculation. But, as stated

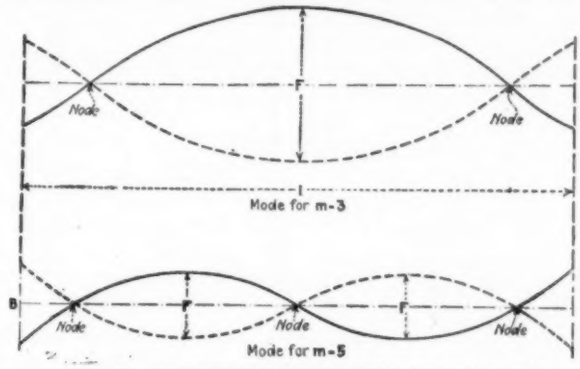


FIG. 8—BUFFER SPRING WITH FREE ENDS

before, the period for these springs, without an attached weight, is seldom required.

The next step will be to introduce the load-deflection rate (l.d.r.) and the equivalent mass factor s in formula (10) for the spring forms just covered under the subject of transverse oscillations. The l.d.r. for a cantilever form of spring is:

$$\frac{F}{P} = \frac{l^3}{3EI}$$

or

$$\frac{3F}{P} = \frac{l^3}{EI}$$

which substituted in formula (10) gives

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\frac{3 \times 16\ WF}{\pi^4 m^4\ P}} \qquad (11)$$

Now $\frac{3 \times 16}{\pi^4 \times (1.194)^4} = s$ as may be seen by comparing this formula with formula (7) and by referring back to the definition of s. Similarly, the l.d.r. for the buffer spring with supported ends and an equivalent load at the center is given by

$$\frac{48F}{P} = \frac{l^3}{EI},$$

which substituted in formula (10) gives

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\frac{48 \times 16\ WF}{\pi^4 m^4\ P}} \qquad (12)$$

in which $\frac{48 \times 16}{\pi^4 \times (2)^4} = s$, and 2 is the fundamental mode factor.

Formulas (11) and (12) are the only formulas re-

quired for flexural springs, inasmuch as formula (11) can also be used for the remaining types of springs, such as the buffer type with free ends, in which case only one overhanging end is considered as was done in deriving the period for the tuning fork. For the spiral and coiled types the values of m are not easily determined.

None of the formulas so far developed give the periods for tapered and triangular springs, without attached weights, because the values of m are not the same for these cases. If a very long tapered spring were to be set in vibration at the end having the smaller section, as in a cantilever suspension, the maximum amplitude of a wave would decrease from wave to wave towards the end of the larger section. This decrease is due to the fact that the wave length and its velocity of propagation are constant as the velocity is dependent only upon the kind of elasticity involved and the density, while the mass increases for a given quantity of transmitted energy.

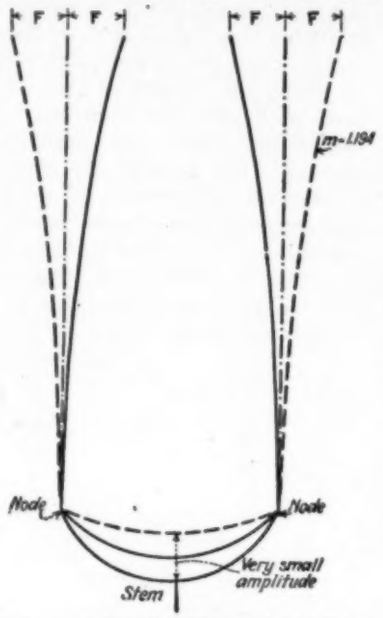


FIG. 9—TUNING FORK SIMILAR TO SPRING AT *B* IN FIG. 8

Witness, for example, the loud crack of a horseman's whip, in which case the oscillations are started at the end of the larger section, instead of the smaller as in the previous case, by a relatively short and quick up and down movement of the arm. The amplitudes of the waves started grow larger and larger, and result in a loud sound of short duration at the end of the whip.

It would be useless to calculate the period of a leaf spring, not having any attached weight, because the excessive damping due to friction between the leaves does not permit such a spring to oscillate freely. With an attached weight such as the sprung weight of an automobile, formula (7) is used.

The main points to be observed in computing the periods for oscillating springs may be summed up as follows:

(1) Formula (7) covered fully in the previous article, gives the period of oscillation of a spring to which a relatively large weight W is attached. It is applicable to any form or type of spring whose l.d.r. (equal to $F \div P$) can be determined either mathematically or by experiment. A large variety of spring forms have a l.d.r., which is mathematically determinant, the expression giving this rate, being called the deflection formula. The general deflection formula as given in the article entitled "Spring Design in General" published on page 757, Vol. 55 of *American Machinist*, is as follows:

$$l.r.d. = \frac{F}{P} = \frac{\psi l^3}{Ebd^3} \qquad (13)$$

in which ψ varies for the different spring and material forms. The values of ψ are given in a table in the article referred to, and l, b and d are the dimensions of the spring.

(2) Formulas (9) and (10), for formulas (11) and (12) are special cases of (10), give the period of oscillation for certain springs, not having any attached weights. These formulas are applicable to the spring forms for which the mode factors m and also the l.d.r. are known. The particular cases for which the values of m are known are covered in this article.

(3) There is also another formula covering the case in which the attached weight is small in comparison with the spring's weight. In this case, the error due to neglecting the mass of the spring, as is done in formula (7), would be appreciable.

However, in cases where the equivalent mass factor s is known, and such cases will be those in which the mode factors m are known, because the fundamental value of m is included in s, formula (7) may be used by simply adding the equivalent weight of the spring $\frac{w}{s}$ to the attached weight W, (multiplied by K^2 in case of a gyrating mass.) This formula is as follows:

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\left(K^2 W + \frac{w}{s}\right) \frac{F}{P}} \qquad (14)$$

(4) It remains now to state a general formula for the period of spring oscillations which, along with the general deflection and spring criterion formulas form the three principal branch "highways" to the main "highway" of spring design. This formula is as follows:

$$T = \frac{2\pi}{\sqrt{g}} \sqrt{\left(K^2 W + \frac{w}{s}\right) \frac{\psi l^3}{E_T b d^3}} \qquad (15)$$

which was obtained by substituting the value of $F \div P$, as given by the deflection formula (13), in formula (14). The different symbols have the following meanings:

VALUES FOR DIFFERENT FORMS OF SPRINGS

Direction of Oscillations		Form of Spring	Condition of Ends F = Fixed R = Free	Value of m for the Fundamental Mode	Values of m for the Higher Modes	Values of s For Any Of the Modal Values m	Values of s With Light or Without Any Attached Weight m = fundamental
	Longitudinal	Helical	1F, 1R	1	3, 5, 7, 9, etc.	$4 \div \pi^2 m^2$	0.40
		Helical	2F or 2R	2	4, 6, 8,10, etc.	$4 \div \pi^2 m^2$	0.10
	Transverse	Cantilever	1F, 1R	1.194	3, 5, 7, 9, etc.	$48 \div \pi^4 m^4$	0.25
		Buffer	2 Supported	2	4, 6, 8,10, etc.	$768 \div \pi^4 m^4$	0.50
		Buffer	2 Free Consider one overhanging End	1.194	3, 5, 7, 9, etc.	$48 \div \pi^4 m^4$	0.25
		Spiral	1F, 1R	1.194	3, 5, 7, 9, etc.		
		Coiled	1F, 1R	1.194	3, 5, 7, 9, etc.		

T=Period of oscillation in seconds.
s=Equivalent mass factor. Values are given in the accompanying table.
ψ=Deflection formula constant. Values were given in the article "Spring Design in General.'
l=Length or load arm of spring in inches.
d=Thickness or diameter of spring material in inches.
b=Breadth or diameter of spring material in inches.
w=Weight of spring in pounds.
W=Attached weight in pounds.
K=Gyration constant=radius of gyration$\div l$; for spiral springs principally.
E_T=Modulus of elasticity (Young's) in pounds per square inch.
g=Acceleration of gravity=381.5 in. per second per second.

When the attached weight is large compared with the weight of the spring, w may be considered equal to zero, and for a spring oscillating freely, W is zero. The factor K is equal to unity in all cases except that of the balance wheel on either spiral or coiled springs, that is, where the weight gyrates about the axis of the spring. The known values for s and m are given in the accompanying table. Such refinements as allowing for shear deflection, "rotary inertia," and symmetrical and unsymmetrical oscillations have not been made in the above formulas, because the insignificant errors caused by neglecting them could easily be obscured by commercial variations in manufacture.

Don't Fool

By Donald A. Hampson

Judge Gary has popularized the slogan, "Don't get hurt" and he might have added one relating to the leading contributory cause of fooling. Carelessness is still the source of most accidents—fooling is one form of carelessness and inattention.

But there is a side of this fooling business that has not been emphasized to the workman. It is a side that has been brought home very forcibly to the parties concerned in some recent accidents. That is, the personal liability where two or more are fooling together.

The statutes in some states completely absolve the employer in such cases—and justly so. More than that, the employer can bring a civil suit against the one who is responsible unless he makes a satisfactory settlement with the injured one himself.

Two lathe hands engaged in a bit of sparring while their machines were running and while the foreman's back was turned. In scuffling about, one of them staggered backward and bumped into the lathe in such a way that his hand, thrust out to catch himself, struck a gear guard with force enough to spring it and his middle finger was drawn into the gears. He lost that finger and the others were badly lacerated. His companion paid for all the costs and the lost time as his share of the "fun."

An employee of a carpet mill in the Hudson valley recently paid $250 to a fellow workman who was injured while they were fooling. He was given his choice of making a satisfactory settlement or defending himself in a civil action. As he had just completed payments on a little home, he chose the former.

Two young men in a machine shop secured some elastic bands from packages that had been received. The bands were sections of automobile inner tubes and were possessed of considerable snap. In flipping them at each other, one of the youths was struck in the eye. His sight was despaired of but after weeks spent in a dark room, he was able to return to his work apparently cured and decidedly more serious minded. His companion in the fooling had just signed the release absolving the employer from any responsibility when the writer visited the shop. Further, he had paid all the costs besides binding himself to recompense the injured one for any later adverse developments.

Thus it will be seen that there is such a thing as personal liability. The three cases cited occurred this past fall within a hundred miles of New York. In each case, the employee at fault was not discharged. However, the facts in the cases were well advertised throughout the plants and have been serious enough to eliminate any and all fooling among the men. If an employee is injured in the discharge of his duties, the employer is liable but if two or more are fooling together, the responsibility shifts to the shoulders of the offending ones.

"Pottering"—What Does It Mean?

By J. T. Towlson

The verb "to potter" is defined by some contemporary dictionaries as meaning "to occupy one's-self with trifles"; "to labor with little purpose"; "to loiter." It may surprise many and interest some to learn that this definition is all wrong; that the word is a good old English idiom, evolved at the time the steam engine was in its swaddling clothes and definitely connected with its early history. Dictionaries compiled before 1790 do not contain the word except in its obvious connection with the making of pottery.

I well remember the tales that were told to me as a lad of seven years or so, now nearly sixty years ago, by my old grandfather; tales that were handed down by him from *his* father, who worked with Jonathan Hornblower on the steam engines designed and built by the latter in the early nineties of the eighteenth century.

It was from him, through my grandfather, that I heard the tales of the lad Humphrey Potter, who, entrusted with the duty of working the valves of a pumping engine, rigged up a tangle of cords weighted with lumps of coal so that the engine would operate its own valves while he played with marbles on the ground beside it.

The story of Humphrey Potter is engineering history now. It was his ingenuity, no less than that of Newcomen and Watt, that gave to the world the splendid self-contained and automatic steam engine of the present day. His "tangle of cords and lumps of coal" carried the germ of the now well-known Joy and Hackworth valve-gears.

My grandfather in telling me these tales, used to add: "Be like the boy, Potter. Do not idle, nor loiter, nor waste time. Invent things; potter about; make machinery displace manual labor, as Potter did." So, you see, the "potterer" may not be the altogether lazy and worthless individual the dictionaries would make him out to be, but rather a studious and inventive genius; a benefactor of mankind. Potter's inventive turn of mind was of great benefit to engineering and the expression "to potter" should have a far different meaning than that which it has.

Ideas from Practical Men

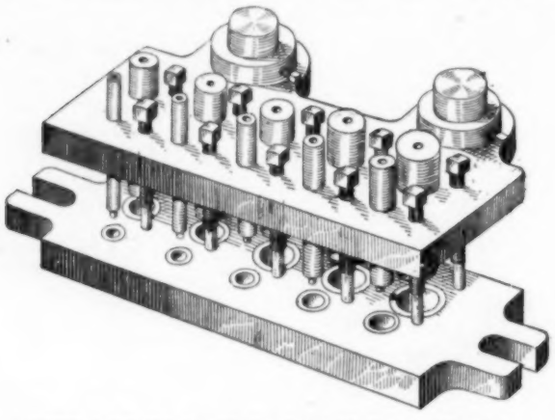
Piercing Die for Experimental Work

By S. N. Bacon

In the model or experimental room of factories where typewriters, adding machines or similar product is turned out it is often necessary to make up quantities of duplicate parts of sheet metal, such as key-levers for a typewriter, key-stems for an adding machine, etc. Levers, arms, bell-cranks and many other parts may be mentioned; all to be made up by hand.

Now it is an easy, even fascinating, job to make *one* part the like of which has never been made before, but to make the other 25, 80, or one-thousand-and-one parts exactly like it, and all by the same slow and tedious processes, is quite another story.

Not the least difficult part of the job is the making



PIERCING DIE FOR EXPERIMENTAL WORK

of holes; round, true to size and accurate in location, in thin material. Everyone who has had occasion to do this knows that a twist drill more than ⅛ in. in diameter is a very unsatisfactory tool for the purpose. The usual way is to drill a very small hole at the intersection of the lines, counterbore it nearly to size and finish with a hand reamer.

My sketch shows a tool that I devised for making such holes quickly and accurately without resort to the counterbore. The basis of the tool is a discarded pillar press from the shop.

In the die bed of this press are set a number of round dies of various diameters and in the punch holder are corresponding punches fitted to slide freely but without shake, each in alignment with its own die. It matters not just where each die and punch is located in the tool as but one is used at a time and the location is a matter of convenience. A number of setscrews interspersed among the punches serve to clamp work upon the die bed, and if the weight of the punch holder is not sufficient to keep it from sliding around, a collar may be setscrewed to each pillar above the punch holder and thus enable the user to apply pressure with the screws.

Each punch is made with a ⅛-in. pilot. The holes are first located in the work and a ⅛-in. hole drilled at the intersection with a twist drill. The proper size of punch is then set in place over its corresponding die, the work put in and located by means of the pilot, and then clamped with the setscrews.

A blow delivered upon the end of the punch with a soft hammer is usually sufficient to drive it through the work. If the hole is too large or the metal too thick to be pierced by the hammer blow, the screw-press or a blanking press may be requisitioned.

The punches are ejected from the work by turning the tool over and driving them back with a hardened steel pin having a clearance hole in the end to cover the pilot of the punch.

The principle of the device may be applied to the piercing of slots, elongated holes and other more complicated forms by splining the punches in the holder to keep them in alignment with their respective dies.

Making an Accurate Square

By Adolph Dieck

By following the instructions and sketches herewith presented, any good toolmaker or machinist can make an accurate square to take the place of the more expensive tools on the market.

Shape up two pieces of tool steel as in Fig. 1, one for the stock and one for the blade of the square. The stock should have a V-groove in one end, in which the blade is to be set. A clearance hole for a No. 8-32 screw is drilled lengthwise through it and thumb grooves should be milled on both sides to facilitate handling it. The blade is ¼ in. square with grooves milled on the four sides. Drill and tap a hole for the No. 8-32 screw, ⅝ in. from one end as shown.

Harden and temper both pieces. Grind the blade square on all four sides and lap until four straight,

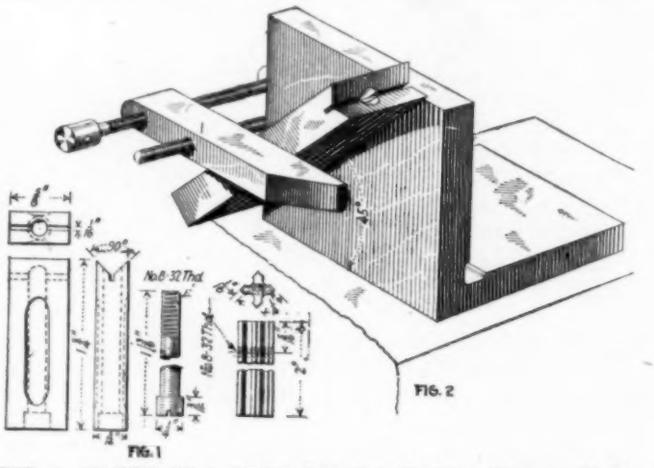


FIG. 1—PARTS OF A HOME-MADE SQUARE. FIG. 2—MANNER OF GRINDING THE GROOVE

parallel edges are secured. Grind and lap the stock on four sides in similar manner, leaving the V-groove to be finished last.

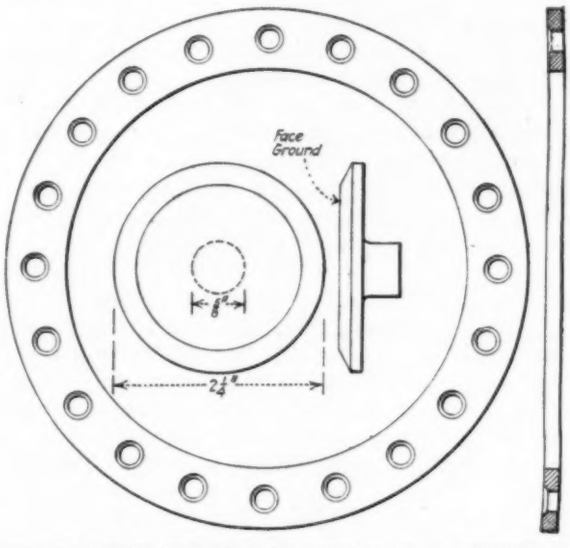
A good way to grind this groove is to clamp the stock on an accurate angle block, as in Fig. 2, setting it at an angle of 45 deg. by means of a protractor. Dress the grinding wheel on the periphery and one side. Set the angle block on the magnetic chuck, using an indicator to bring it parallel with the travel of the machine table. Then lightly touch up both sides of the groove until it is cleaned up. Assemble the tool by means of the screw passing through the stock.

This makes a very handy square for the toolmaker to carry with him. Its accuracy depends mainly upon the accuracy of the block upon which the stock is ground and the care the maker exercises in the production of the parts. It presents a line contact to the work to which it is applied, and all four edges of the blade may be brought into service.

Cheap Holder for Grinding Bushings on End—Discussion

By E. A. Limming
Guildford, England

On page 425, Vol. 57, of the *American Machinist*, Hiram Hicks shows a jig for holding bushings to grind the end faces of a rotary grinding machine. Bushings are but one example of work on which facing operations by grinding have to be performed and the rotary type of grinding machine, by dealing with batches at a time,



JIG FOR HOLDING THRUST BUTTONS FOR GRINDING

can do them so much cheaper than the cylindrical type of machine that is now being extensively used for this purpose. An additional point in its favor is the simplicity and cheapness of the jigs required.

In the jig shown in the article cited the bushings are held in place in V-shaped notches and secured by clamps, but the machine on which the jig is used apparently has a horizonal spindle. It has been found that on machines of the vertical type—like the Blanchard—that uses a ring or cup wheel, any gripping of the article to be ground is unnecessary. Gears and bushings similar to those mentioned are either placed on studs or in holes according to which method is the more suitable or convenient, and no further means of holding need be provided.

An outstanding and instructive example of the superfluity of any gripping device under these conditions is well demonstrated by the jig used in grinding the faces or thrust buttons, one of which is shown enlarged in the center of accompanying illustration. The jig is a ring of cast-iron through which twenty holes are drilled and countersunk to accommodate the stems of the buttons. The buttons are turned from 2¼-in. bar, case-hardened and sand blasted. They are just dropped into place, yet, though because of the shape of the jig the magnetism of the chuck can exert but a very slight influence, the hold is sufficient.

It was thought at first that because of the comparative sizes of the faces and stems of the buttons it would be necessary to make the jig in two parts tied together by a non-magnetic bridge, the two parts to lie on adjacent and opposed annular pole faces of the chuck so that the magnetic lines of force would have to pass through the buttons. Actual experience, however, showed that even in this extreme case a locating hole for the stem was all that was needed.

Certainly the buttons rotate under the action of the grinding wheel nevertheless the grinding is quite satisfactory.

Setting the Lathe Tool for Turning

By Harry Senior

A. W. Forbes certainly scratched a fertile subject for discussion when he asked the question, so long ago that I cannot remember when [page 612, Vol. 53—Ed.] as to whether a lathe tool should be set on the level of the lathe center, above, or below it. Since then it has been hashed over by dozens of contributors many of whom have, in my opinion, failed to grasp the real significance of Mr. Forbes' query, which was, not *where* you should set the tool but *why* you should set it there. I even took a hack at it myself.

Now comes S. R. Hunter of the Irememberwayback-when Club who, on page 878, Vol. 57, again tells us where to set the tool and again fails to tell us why. I would like to ask Mr. Hunter a question—not for his benefit nor for mine, but for the benefit of the readers of *American Machinist*. In doing so I will take the liberty of referring to his own illustrations on the page mentioned above.

He says he is of the opinion that "the best results can be obtained if the cutting edge of the tool is set on a radial line from the center of the work being turned," (incidentally, how could it be set elsewhere?) and shows in his Fig. 1 some examples of such setting. In his Fig. 2 he shows examples of (presumably) wrong setting.

The question I would ask is this: If the angle of tangency that is presented by the top and front end of the tool to the circle which is the perimeter of the work (rake and clearance angles) are the same as are shown to the left in his Fig. 1 (assumed to be correct), *what difference does it make whether the edge of the tool is above or below the level of the center?* What difference, for that matter, if it be on top, on the bottom, or upside down at the back?

It *would* make a difference, but the difference has nothing whatever to do with the cutting action of the tool.

A Set-Up and Checking Gage

BY C. E. STEVENS

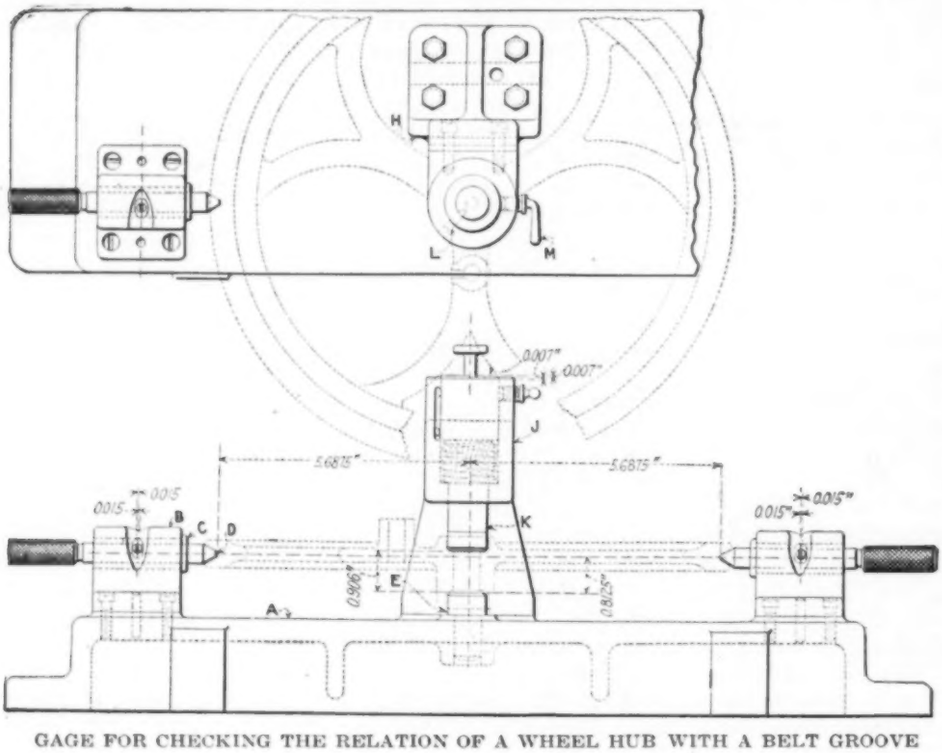
In machining a cast-iron drive wheel, the belt groove on the outside diameter and the hub were finished in one operation on a Potter & Johnston semi-automatic lathe. A stellite form tool was employed to turn the outside diameter and the belt groove while two counterbores were used on the hub. One counterbore was placed in the turret, while the other was operated through the spindle.

It was necessary that the counterbored hub be in the right relation to the belt groove. This relation gave considerable trouble in setting up, as several temporary gages were first used. To overcome this difficulty, the gage shown in the accompanying illustration was designed to give a complete gaging in one setting of the wheel. This gage and a no-go plug gage were the only gages employed in checking the wheel.

The base *A* of the gage shown is cast iron, webbed for lightness and durability, and machined to receive the smaller details. Two machine-steel blocks *E*, which contain the bushings *C* and the plungers *D* are fastened to the base *A* by four 1¼-in. fillister-head screws and two dowels. The bushings *C* are cut away and have a line cut on them which is the normal for the two lines that are cut on the plungers *D*, these two lines being $\frac{1}{32}$-in. apart, or the amount of tolerance on the groove. The tool-steel plug *E* is pressed into the base A and has a diameter that is the low limit of the counterbore. The distance from the top of the plug to the center line of the plungers *D* is the same as that from the center of the belt groove to the bottom of the counterbore.

A cast-iron bracket *H* is attached to the base *A* by four ¼-in. hexagonal-head screws and two dowels. To this bracket is fastened the block or bushing *J* which is made of machine steel, bone-hardened and ground to receive the plug *K*. This plug is held in the upward position by a light coil spring, but is prevented from coming out of the block *J* by a small headless screw *L* which, as shown, slides in an elongated slot. The plug *K* has a step limit of 0.015 in. ground on the top, which is ± 0.007 in., the normal being the top of the block *J* when the bottom of the plug *K* is the correct distance from the center line of the plungers *D*.

In gaging, the wheel is placed in the bracket *H* and set on the bottom plug *E*. The plunger *K* is brought down to the bottom of the counterbore. The small handle screw *M*, which is backed up by a small brass plug, is tightened, holding the plunger down in place, while the plungers *D* are brought in from the sides. By a gage of this type the limits of the wheel can be easily checked.



GAGE FOR CHECKING THE RELATION OF A WHEEL HUB WITH A BELT GROOVE

Holding a Drill on the Tail Center

BY HARRY SENIOR

On page 1006, Vol. 57, of *American Machinist*, there are shown two devices for holding drills in or on the tail spindle of a lathe, one involving the use of a chuck and the other intended to hold the drill against the tail center. Each of these devices will doubtless do all that its respective deviser claims for it but both of them embody the defect of imposing the pressure of the cut upon a part that was never intended to withstand it, the spline of the tail spindle. Neither should be (and probably would not be) tolerated in any well-regulated machine shop.

The tail spindle of an engine lathe is prevented from rotating by what is known as a "spline and feather" —if we may say it in the language that has been handed down to us from our forefathers—and the sole duty expected of these parts is to resist the very slight tendency of the spindle to revolve because of the friction of the work upon the center.

The "spline" is a groove of rectangular section extending lengthwise of the spindle for perhaps half its length and is seldom more than ¼ in. wide by ⅛ in. deep, often less. The "feather" is essentially a piece of metal, the exposed portion of which is fitted to slide freely without shake in the spline.

The feather is made in many ways by the various lathe builders. In some cases it may be a square-sectioned key, possibly a couple of inches long, with one-half of its remaining dimension embedded in a slot, similar to the spline, cut in the bore of the tailstock; in others it is a thinner piece, almost of sheet metal, held in the slot that is made in the barrel of the tailstock for the purpose of allowing the latter to be clamped upon the spindle. In some lathes the feather is shaped upon the end of a headless screw that is tapped radially into the bore of the barrel, and in such case it can be no longer than the diameter of the screw.

This, then, is the bearing that is called upon to withstand the torsional effect of

rotating a drill (or what amounts to the same thing, holding the drill stationary while the work rotates) that is sufficiently large to require setscrewed collars upon the outer end of the spindle. The radius at which this thrust is imposed can never be more than one-half the diameter of the spindle and the bearing is seldom more than 1 in. in length. It is not surprising that under such treatment a lathe should develop trouble in the tailstock and become unreliable for accurate work.

It is not objectionable to use a small drill that is held in a chuck, the shank of which is fitted to the taper hole in the spindle, but if the power required to drive the drill is sufficient to wring loose the taper shank it has already overburdened the spline and feather. This bearing should never be called upon to drive a drill held as is the one shown in Harry Moore's sketch upon the page mentioned above. A bar of some kind (preferably of wood) should be rested across the shank of the drill and under the tail of the dog, with its outer end bearing upon the wing of the carriage. The pressure is thus delivered, at a longer radius, upon a part amply capable of withstanding it.

If Mr. Moore, or anybody else, has ever drilled for never so short a distance into a piece of metal with a drill of the proportions and held in the manner indicated in his sketch, without detriment to the lathe, he has wasted time; for if such a drill is driven to anywhere near its capacity it is capable of shearing the feather or upsetting the edge of the spline badly enough to require immediate repair before it has reached its full diameter in the work.

Unsafe Safety Devices

By P. P. Fenaux

The home-made crane described by Milton Wright on page 655, Vol. 57, of *American Machinist*, shows a considerable degree of ingenuity in its devising and the manner of attaching it, but it evidences also a lamentable disregard of the elements of safety. Seldom are these elements given proper consideration, even though we think that we are putting the idea of safety foremost.

What may be going on overhead appears to be of little concern to anybody so long as the building stands and exhibits no sign of distress. Pipes, countershafts, tackles, cranes, etc., will be added from time to time to the burden of a ceiling on the other side of which machinery, stock, trucks and men may have already imposed a load sufficient to encroach upon the factor of safety.

Fortunately, perhaps, for the peace of mind of many shop managers, factors of safety have little meaning to them. And not only do they err in overloading their buildings but often the safety of a so-called "safety device" is not given sufficient consideration. I am reminded of a case in point that occurred in a large eastern plant wherein there was a safety committee that prided itself upon its ability to discover and eliminate dangerous conditions existing around the plant.

There was an elevator belt running under the ceiling of a basement and spanning a much used passage way. The minimum distance of the belt from the floor of the passage way was 7 ft., sufficient clearance for anything that was expected to pass that way—but suppose it should break when a man was passing?

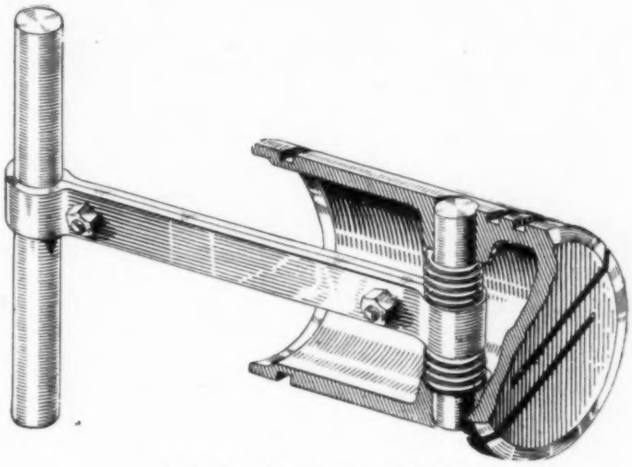
The safety committee caused the matter to be investigated and the case was deemed dangerous enough to warrant a guard of some kind. The committee so ordered, the order was viséd by the management, and in due time reached the boss carpenter, who was depended upon to carry it out. This worthy took two of his men to the place, sized up the situation and said: "Oh, h—l! Stick a coupla boards under the d—n thing."

Accordingly four uprights were nailed to the floor-beams, projecting down below the belt. The lower ends of the uprights were connected by cross pieces and to the under side of the latter two ⅞-in. boards were nailed, the nails not even being clinched. If the belt *should* break, these boards would serve only as additional projectiles to bombard the innocent passer-by. But the guard is still there, a monument to the vigilance and enthusiasm of the safety committee.

One-Part Expanding Cylinder-Lap

By George A. Luers

When lapping scratches and slight scores from cylinders of engines, the piston lap as illustrated in the sketch herewith is especially serviceable, in that it is easily made and, being in one part, can be removed and replaced without undue difficulties in handling. The practice of sawing a piston in half and using the halves with a spring between the sections is unhandy, in that the halves separate when removed from a cylinder, necessitating time to re-assemble. The construction shown is a piston sawed partly in two. The saw cuts are made to overlap, but do not intersect. Springs are placed on each side of the handle extension at the wrist pin bosses and hold the sides of the piston extended with sufficient pressure to insure the abrasive being pressed against the cylinder wall while lapping. The unit is compact and does its work effectively without the care required for a lap of the segmental type.



LAP MADE FROM A PISTON

The usual wooden handle and iron strap are the means of hand operation. For use in a vertical drilling machine a suitable shank for the machine spindle is substituted for the iron strap. A local repair shop uses this form of piston lap for each size of engine handled, having discarded the previous laps for the reason that much time was lost in placing them in the cylinders. This lap can be removed as frequently as desired, fresh abrasive applied and it can then be slid back into the cylinder, head first, without need of holding or compressing it to enter.

American Machinist
Established 1877
KENNETH H. CONDIT AND FRED H. COLVIN
Editors
January 18, 1923

How Soon Should John Doe Replace That Old Machine?

IF THE manufacturer of machinery had a complete history of every machine that he ever made, he would know just about where to go to find the most likely market for his present product.

In addition to the existing services of the technical paper, his agents, his salesmen, and the newspapers in locating new prospects, he would know from his record of machines sold, which ones had probably outlived their usefulness and should be replaced. Nothing would be easier than to arrange his history as a tickler and have a clerk once each month advise agents and salesmen of replacement prospects in their territories.

All manufacturers keep records of their machines by serial numbers, date of sale, and purchaser. But they don't know what becomes of the machines after the original purchaser is through with them. Nor can they know without constant and expensive follow-up unless the seller of a machine, whether new or old, will voluntarily report the sale to the manufacturer. That in the long run he might benefit from doing so is not inconceivable. But it is beyond credence that he would make the report without hope of equal return. Which points out that some form of reward would have to be inaugurated by the manufacturer—perhaps a limited amount of consulting service, or the like.

Aid to the manufacturer would be the primary intent in a system of reporting sales. But there would be important byproducts that, as frequently happens, might become more important than the object at first sought. Any machine manufacturer would be in a far better position than he is in today to forecast his own business. Then if he and all other manufacturers of milling machines, motors or multigraphs sent their data to a clearing or statistical bureau, controlled by themselves, the machinery industry would at last have a source for facts, something deplorably lacking now.

About the Names of Things

ALTHOUGH it may take years to secure the universal adoption of the standards being formulated and recommended by the various committees now at work, they will gradually become standard practice and we shall be the better for it. The adoption of the U. S. S. form of thread was slow in coming. Being first advocated by William Sellers and later by the Franklin Institute, it is now used not only in this country but in many others. The proportions have been changed to some extent but the thread with a flat top and bottom is almost universal outside of Great Britain.

New conditions have made finer pitches desirable in many cases and interchangeable manufacture has made standard tolerances necessary. But these only supplement and do not supplant the work of the pioneers.

Standardization can and will simplify manufacturing and eliminate much economic waste which now exists in capital tied up in needless sizes and kinds of machines and accessories. The cost of repairs on automobiles, locomotives and machinery of all kinds will be greatly reduced by a greater standardization of such parts as are common to various machines.

There is, however, a great need of standardization in another line, namely, in the nomenclature of the machine building industry. We have no standard names for such simple things as bolts, nuts and screws. If you doubt it just send an order to different stores or makers for round head, oval head, French head, cheese head, flat head and fillister head screws and see what you get. Or ask a dozen makers to define machine screws, stove bolts and cap screws. Or ask them to tell you the difference between a hand screw machine and a turret lathe.

There is no more needed field of standardization than that of the nomenclature of the machine building industry. The lack of it causes annoying delays and money losses which count up in a much larger total than might be imagined. A rose by any other name may smell as sweet, but it is annoying and expensive to order a rose reamer and get a three fluted drill.

Tools Should Be Sharpened When They Are Still Sharp

THE IDEA THAT tools must be sharpened when they are dull is so natural that no instructions need to be given on this point. On the other hand it seems to be taken for granted that no tool should be sharpened until it is dull and this is far from right. Just when a tool should be sharpened is a matter for discussion but that we should not wait until it is dull seems clear enough.

The life of expensive tools, such as milling cutters, broaches, etc., may be much prolonged if they are sharpened at the proper moment. One sixteenth of an inch, or perhaps an eighth, may have to be ground off the teeth if the cutter has been in use one minute too long, whereas five thousandths might have been sufficient if it had been in work one minute less.

There is not only a loss of tool value but also of production, for the man who does the work or supervises it is almost sure to go to the safe side by reducing feeds or speeds. He may not be able to produce more work with one sharpening of the tool, but he can at least point to the length of time the tool has been in use. Not everyone realizes the fact that time means nothing and that it is production which counts.

We cannot gage to a minute the time when the tool should be sharpened but we can make observations which will enable us to remove the tool and sharpen it before it is so dull that a large amount must be ground off. If our experience shows that the cutter becomes dull after milling 200 pieces, let us examine that tool after 150 or 125 pieces and observe when it *begins* to get dull. If we find that the first signs

of dullness appear after 175 pieces let us stop at 150. We will find that the period between beginning to get dull and complete breakdown is very short. When we are reasonably sure that a certain number of pieces can be milled or drilled or faced, before the tool becomes really dull, and when we have allowed a reasonable factor of safety, let us make it a point to sharpen the tool at that particular output and give instructions accordingly.

We do not get the greatest ouput by letting a man work till he faints from exhaustion before we let him rest and feed himself; neither will we get the greatest possible results from a tool when we wait till it breaks down before we restore it to the proper condition.

Teach Cleanliness in the Machine Shop

ONE OF THE reasons why boys do not hasten to learn the machinist's trade is the dirt and grime of the shop. For in too many cases it leads to a carelessness of personal habits and who can blame a mother or a best girl for preferring some less dirty occupation for her boy? Other things being equal, is there any reason for picking a dirty job unless one has such a decided taste for mechanics that nothing else will satisfy?

The average boy has no such leaning and it is up to us to show him that few white-collar jobs are equal to that of a skilled mechanic. He can be shown that, while oil and metal chips do soil the hands and cannot be eliminated, he can leave the shop as clean as though he sold silk sox or worked in a bank. And furthermore, that his work is more important, more fascinating and has greater opportunity for advancement.

There is no need for any boy or man to leave a modern shop looking like a coal heaver. Nearly all shops now provide modern wash rooms in which men can wash thoroughly, and part of the boy's training should be to urge him to be neat and clean when he leaves the shop. If the washing facilities are not adequate, means should be provided so that the boys and men can get clean, and without delay. For no one likes to be delayed in getting home after the day's work.

The wearing of clean overalls should be encouraged, even to the extent of washing them frequently without charge. Better yet, the street clothes should be removed while in the shop and replaced with old clothes or simply overalls, as preferred. The best mechanic we ever knew always left the shop looking as neat as any banker. No boy should get the false notion that greasy clothes and a dirty face denote the best mechanic. The opposite is usually the case. He should not shun dirty jobs, because they frequently require great skill, but no boy should be content to remain dirty or to go home in this condition.

A campaign for cleanliness in connection with any apprenticeship course will have good results in different ways. It will elevate the morale of boys already in the shop. It will aid in overcoming home objections and social prejudices and so will help materially in securing a better class of boys. And, indirectly perhaps, it will help by having better care taken of the company's property.

Is Our Present Civilization Actually a Failure?

DEXTER S. KIMBALL, past president of the A. S. M. E., speaking about "The Engineer in the Nation's Progress," said the charge is made that modern civilization is a failure. We agree fully; the charge is made and remade and repeated again and again, and to prove this charge defects are shown up, unsatisfactory conditions are pointed out and the present conditions of unrest are quoted. And yet we fail to see the connection between the facts which are presented and the conclusion which is drawn.

To say that the *present* civilization is a failure is equivalent to saying that the one past was better. Else why the plaintive tone. Again, if the civilization of the past was better we should be willing to go back to it if we can. Now, how many of those who bewail the past are willing to live under the conditions of two hundred years ago? A few, perhaps, but certainly not many. Those who might be willing to go back are probably the men who have wealth and who love to lord it over others, those who would like to spend their lives in idleness and have the means to do so. For such men the present civilization is a failure for there is no honorable place for the idle and class superiority is laughed out of court.

How about the worker, the man who is not satisfied with things as they are, would he go back? A superficial comparison between now and then will be sufficient to convince anybody that he would not. His condition is so much better than it was that only complete ignorance or supreme folly could make him wish for the past. As a matter of fact, he does not. He wants conditions better than they are and nothing could be more correct, more just than that.

There was a time when he was not satisfied, and when his voice was not heeded. There was nothing for him to do but submit and suffer. That kind of civilization was a failure. As it is now, every man is permitted to strive, to express his wants and desires, and to bring his own little brick of progress and add it to the rising walls of the home we are to live in, our future civilization. The house is not yet completed, far from it. The plans are not entirely correct and must be altered as we progress and find defects, and once in a while we must pull down parts which have been erected and prove to be wrong or untrustworthy. But after all the building is going up. It is not a failure, it is merely not complete and those who have to find shelter in it are a little impatient.

IF WE COULD turn metal at sawmill speed, we would not be interested in heavy chips and heavy tools and heavy machines. And yet there is no pride like the pride of the man who produces chips with which one could fell an ox. The greater part of the development of tools has been along the lines of might and size. Why not start in along the lines of speed, which would remove metal without distorting the work? Let us explore a little; we may find fertile fields.

Shop Equipment News

Carroll 16-Inch Motor-Driven Quick-Change Gap Lathe

The lathe shown in Fig. 1 is made by the A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio. It is especially intended, when equipped with the drive shown, for automotive repair shops, general repair shops or any place where a self-contained lathe unit is wanted for general use.

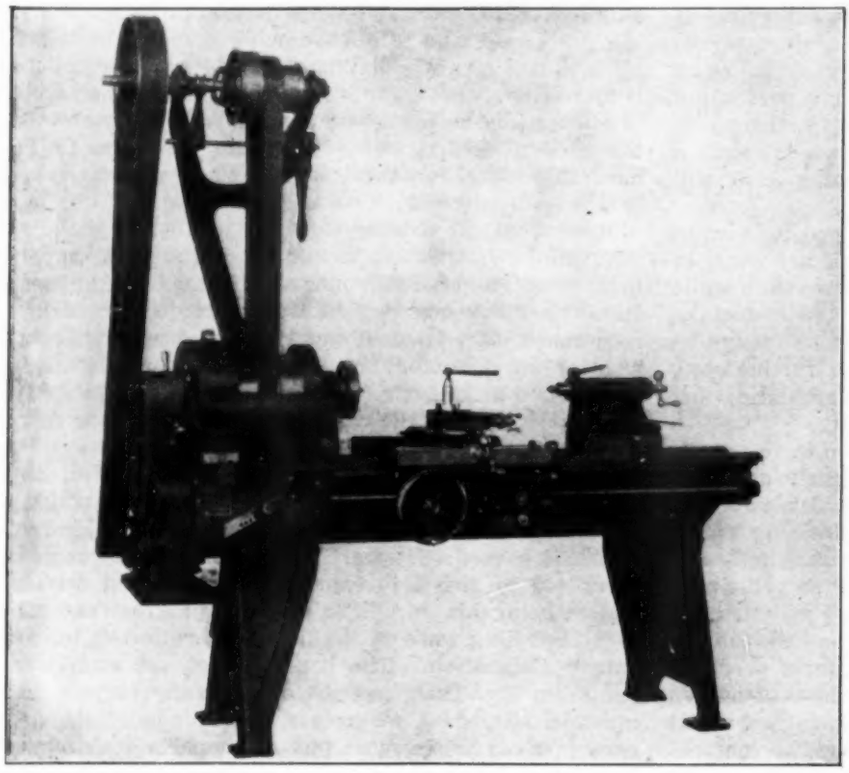


FIG. 1—CARROLL 16-IN. MOTOR-DR IVEN QUICK-CHANGE GAP LATHE

The bed is made with what is called an "invisible gap," obtained by eliminating the inside ways near the head, as shown in Fig. 2. A 12-in. girder supports the bed at this point to give it extra strength. The construction is similar to that used on the 14-in. Carroll lathe described on page 884, Vol. 54, of *American Machinist*. The carriage ways are chilled in order to give long wear.

In the bowl-type headstock all gears are covered and bronze bearings are used. The lathe is rated as 16-in., but the gap allows a swing of 19 in., and by raising the headstock on special blocks a swing of 22 in. may be obtained without altering the gear box or intermediate gears. Either three- or four-step cones may be had, and either single or double back-gears.

The carriage is fitted to receive a taper attachment, which may be put on at any time. The apron gears and studs are of steel and bronze. The machine has the usual interlocking feeding device, and right- or left-hand feed arrangement. The compound rest has taper gibs and a large graduated base.

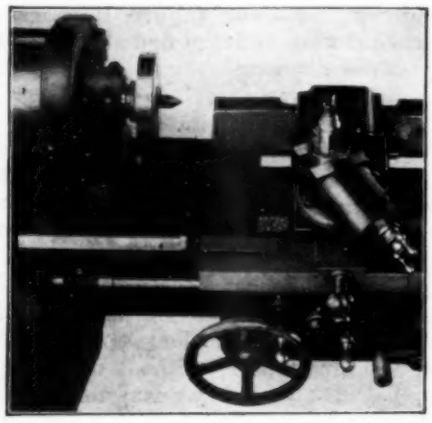


FIG. 2—VIEW OF BED, SHOWING "INVISIBLE GAP"

The quick-change gear box gives twenty-four feed changes by shifting one lever. Change gears can also be used on the end of the lower drive shaft for any odd thread. The tailstock has the regular set-over feature and self discharging center.

The beds are made 6, 8, 10 and 12 ft. long. The 6-ft. lathe will take 40 in. between centers and weighs 1,950 lb. when boxed for export. The usual equipment goes with the lathe.

Weaver "High-Speed" Hand Screw Press

A hand-operated forcing press for general use, particularly on that class of work encountered in garage repair shops, has recently been developed by the Weaver Manufacturing Co., Springfield, Ill., and placed on the market under the name of the "Hi-Speed" press. In most of its general features, the press is similar to that described for the same concern on page 569, Vol. 41 of *American Machinist*. The principal difference is the fact that it is equipped with a mechanism that enables it to be operated as an arbor press, as well as a screw press.

The accompanying illustration shows the press being employed as an arbor press, for which purpose it is operated by the lever on the central housing. This lever actuates a pinion that meshes with a rack cut in a sleeve fitting over the screw of the press. The sleeve is attached to the plate of the thrust bearing, so that by pulling down on the lever, both the handwheel and the screw can be lowered as a unit a distance of approximately 2 in. This mechanism is of particular use when pressure under 2,000 lb. is sufficient, and it provides a sufficiently sensitive means of pressing in bushings, as the operator can feel when the right amount of pressure has been reached.

If a greater pressure is required than can be supplied by the rack and

pinion mechanism, the screw can be fed downward to the work by spinning the handwheel. The ratchet lever on the left of the press is then dropped into position on the handwheel and pressure applied by pulling down on the lever, which in the accompanying illustration is shown in its out-of-use position. Two ratios of leverage, one 1,500 to 1, and the

WEAVER "HIGH-SPEED" ARBOR AND SCREW PRESS

other 3,000 to 1, are provided by this mechanism. Thus, work requiring pressure up to 60,000 lb. can be handled in the press. It is not necessary to change the position of the work when changing from one leverage to the other. Since the pressure is always exerted downward on the levers, the press need not be bolted to the floor.

A device consisting of two cam-faced washers in the thrust bearing, enables the pressure to be instantly relieved by one reverse stroke of the lever. The handscrew can then be spun to quickly raise the screw, without the necessity of backing off gradually with a slow-speed motion.

The frame of the press is made in one piece. The bolster can be set in any position on the frame to give the proper space for the work. A faceplate, two pressure blocks, two vise blocks and two sections of 6-in. channel steel are furnished for use in holding the work. The regular size of press has a distance of 32 in. between the uprights, but a press 42 in. between the uprights can be supplied to handle work that is too large for the smaller press.

Carroll 12-Inch Quick-Change Gap Lathe

The 12-in. "invisible-gap" lathe shown herewith is made by the A. V. Carroll Machine Tool Co., Norwood, Cincinnati, Ohio. While normally rated as a 12-in. machine, the bed is so made that chuck or faceplate work up to 14 in. in dia. may be turned. The "invisible-gap" bed construction is similar to that described on page 884, Vol. 54, of *American Machinist*. The lathe is made for belt drive with a three-step cone and single back-gear. The quick-change gear box has all steel gears, and the use of one gear-shifting lever gives twenty-four feed changes.

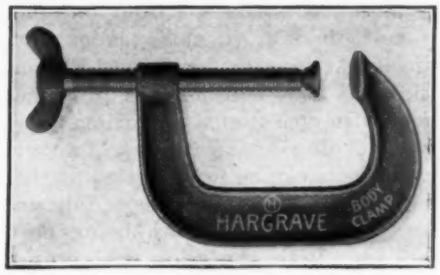
The headstock is of the bowl type with all gears covered. It is so made that raising blocks may be easily placed under it to give additional swing without altering the gear box and intermediate gears.

The carriage has a thread indicator or chasing dial, and is arranged for a taper attachment, which may be ordered and placed on it at any time. The reverse for right-hand or left-hand feeds is obtained from the apron.

The compound rest has taper gibs throughout and a large graduated base. Three lengths of bed, 3 ft. 8 in., 4 ft. 8 in. and 5 ft. 8 in., are regularly made.

Hargrave C-Clamp

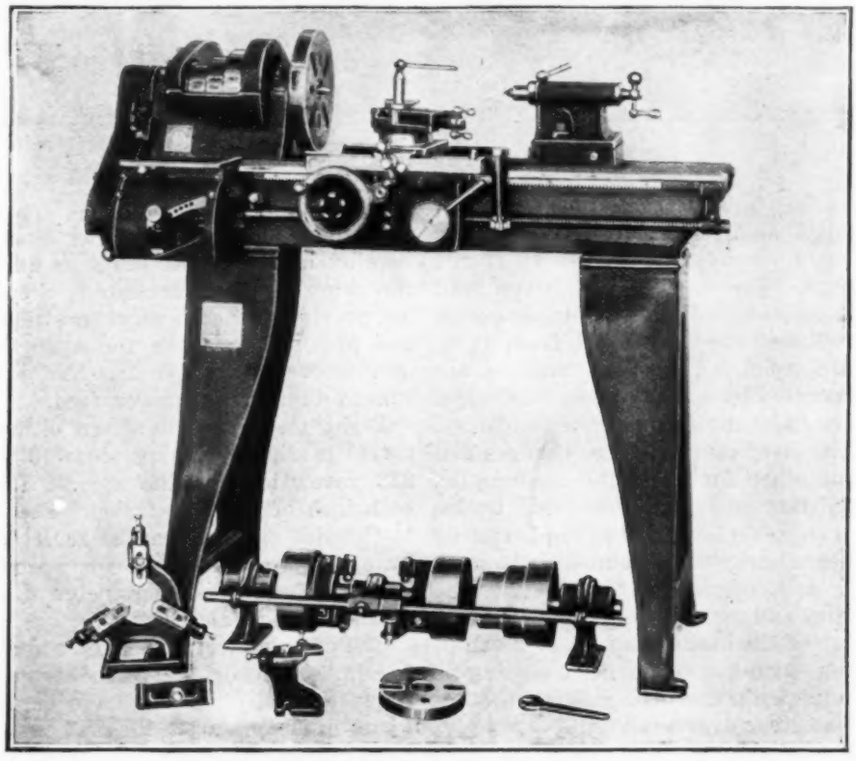
The clamp shown is intended especially for automobile body work, pattern work, or for any place where the work requires a greater reach than the ordinary C-clamp will give. The steel screw is cut with a deep Acme thread, which, it is claimed, gives a better bearing and more



HARGRAVE C-CLAMP

clamping power than the square thread, and also lengthens the life of the tool. The clamp screw can be furnished with either an end button, or a ball-and-socket oscillating tip, to suit the type of work being performed. The frame of the clamp is of I-section, strong enough to withstand any force that can be exerted when screwing the clamp by hand.

The clamps are made in 3, 4, 5 and 6 in. sizes, with $2\frac{5}{16}$, $2\frac{1}{2}$, 3 and $3\frac{5}{16}$ in. throat depth, respectively. They are made by the Cincinnati Tool Co., Norwood, Cincinnati, Ohio, and are sold under the name of Hargrave.



CARROLL 12-INCH QUICK-CHANGE GAP LATHE

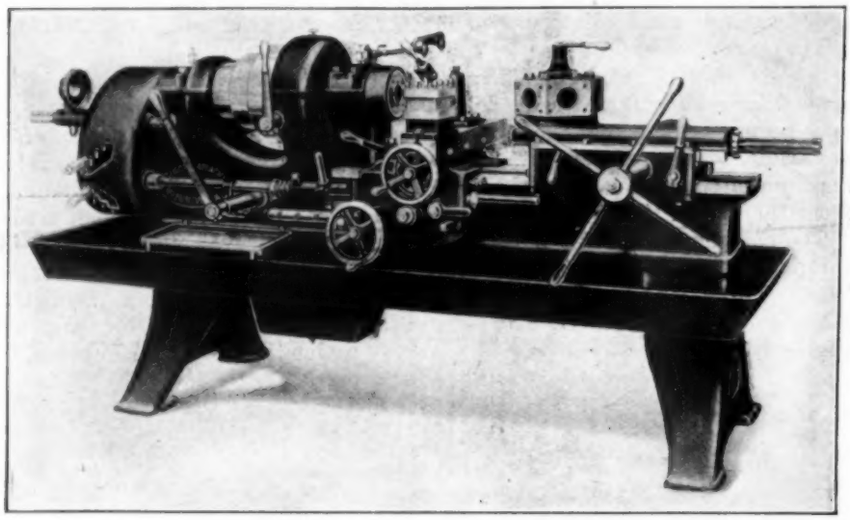
Cincinnati Acme No. 1 Universal Turret Lathe

The machine shown herewith is the product of the Acme Machine Tool Co., Cincinnati, Ohio. In the design of this No. 1 universal turret lathe many features have been embodied with the view of making it a high-production machine for the manufacturing of parts from bar stock, castings or forgings. Eleven different tool stations are provided for such operations as boring, facing, turning and forming. Two or more tools can be in operation at the same time, the number depending on the contour of the work being machined. Both the main and cross-slide turrets may be operated simultaneously or independently, as they have separately controlled feeds.

Two models of the machine are made. One has a cone-pulley driven head, as illustrated, and the other has a single-pulley driven all-geared head. The single-pulley driven head is of the sliding gear type giving twelve changes of speed from 18 to 318 r.p.m. The speed changes are operated by means of two convenient levers on the front of the headstock. One lever controls three changes and the other four, and the combination of the two furnishes the twelve changes. The sliding and mating gears are of chrome-nickel steel. Splash lubrication is used. The stop and reverse lever is placed on top of the headstock in easy reach of the operator. The head casting is solid with the bed, making the entire structure very rigid.

The side carriage spans the ways of the bed, and there is no overhang to the turret and tools. It is so made as to clear the chuck, and can be run out of the way to permit using short tools in the main turret. Six independent stops for the longitudinal movement are provided. The square turret is mounted on the cross-slide and is positioned by a hardened lock-bolt located directly under the cutting tool. It can be indexed to four positions, a single vertical movement of the top lever unclamping the turret and withdrawing the bolt.

The main turret is hexagonal in shape and provided with six tool holes fitted with binder bushings. Each turret face has four tapped holes also, for securing tools to it. The turret locking bolt is placed at the front end of the slide and works in hardened and ground taper bushings let into the solid turret as near the outer edge as practicable. Stops are provided for each turret position, and provision is made for a slight over-feed. The stops are also arranged to trip the power feed.



CINCINNATI ACME NO. 1 UNIVERSAL TURRET LATHE

Eight feeds may be given either turret carriage, varying from 13 to 333 revolutions of the spindle for each inch of carriage travel. Feeds to the side carriage can be reversed by operating a knob on the apron. There is a large micrometer dial on the cross-feed screw.

The machine will take 1½ in. round, 1⅛ in. square or 1⅜ in. hexagonal stock, the hole in the spindle being 1⅞ in. in diameter. Stock can be machined 9 in. in length and up to 18 in. in diameter.

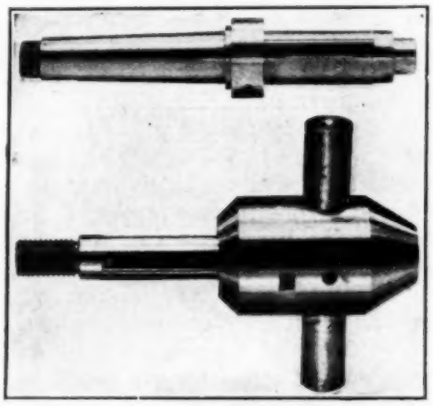
For the geared-head type of machine a 2-hp., 1,200-r.p.m., constant-speed motor is best, while for the cone-head type a 2-hp., variable-speed motor running from 500 to 1,500 r.p.m. is recommended. The machine weighs net about 3,150 pounds.

"Ettco" Special Self-Gripping Mandrels

Special types of the "Ettco" self-gripping mandrel have been developed by the Eastern Tube & Tool Co., Inc., Brooklyn, N. Y. to adapt the tool to many classes of work. The plain mandrel with centers in each end was described on page 962, Vol. 53 of *American Machinist*.

The body of the mandrel is equipped with three grooves, each groove containing a small hardened steel roller that it held in place in the gripping position by means of a flat spring. The diameter over the small rollers can thus be varied by shifting the rollers in the slots. The work cannot be turned in one direction on the mandrel, as it is wedged tightly while the cut is being taken. By twisting it in the reverse direction, it is released and can be slipped off the mandrel. The advantage of the construction is that it is not necessary to drive the work on the mandrel, as when a tapered mandrel is employed. A greater speed of operation in putting on and removing the work is thus possible.

The mandrel at the top of the illustration is equipped with a taper shank and the one at the bottom with a threaded end. It can be seen that in the latter case the mandrel does not pass completely through the work. Special mandrels to fit Lo-Swing and Fay automatic lathes as well as other automatic and engine lathes, can be furnished.



"ETTCO" SPECIAL SELF-GRIPPING MANDREL

Storm Cylinder Refinishing Machines

The Storm Manufacturing Co., 406 Sixth Ave. South, Minneapolis, Minn., has recently developed a process known as "Stormizing" for refinishing the cylinders of automotive engines. The process consists of first truing up the worn cylinder by a cutting operation, and then by a second operation grinding or honing the surface to give a fine finish. The machines that have been developed for this work are of different types to suit working conditions, and in the main consist of the models formerly made by the concern, but with the addition of the spindle carrying the finishing head. Thus each machine really consists of two units, that make it applicable to both cutting and grinding operations.

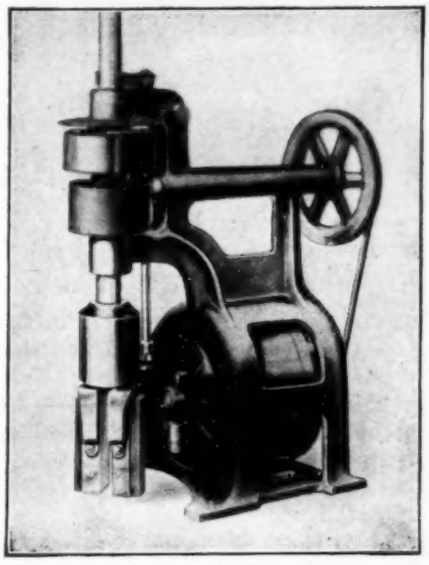


FIG. 1—STORM AUTOMATIC FINISHING MACHINE

The finishing head that carries the abrasive block was described in detail on page 746, Vol. 57 of *American Machinist*. It has a capacity from 2¾ to 8 in. in diameter and can be driven by a drilling machine or portable electric drill, as well as by the machines that are illustrated herewith.

In cylinders that are uniformly and only slightly worn, the finishing head can be used without any previous cutting operation. An electric driven unit for this purpose is illustrated in Fig. 1. The machine is self-centering and automatic in operation. The head is simply inserted in the cylinder and the collar set to actuate the automatic reverse at the proper point. The head then passes back and forth through the cylinder at a uniform rate and produces a uniform finish throughout. This equipment is suitable for use on cylinders that have previously been bored or reamed to accurate shape. It is thus applicable to use in shops already equipped with tools for accurate reaming or boring.

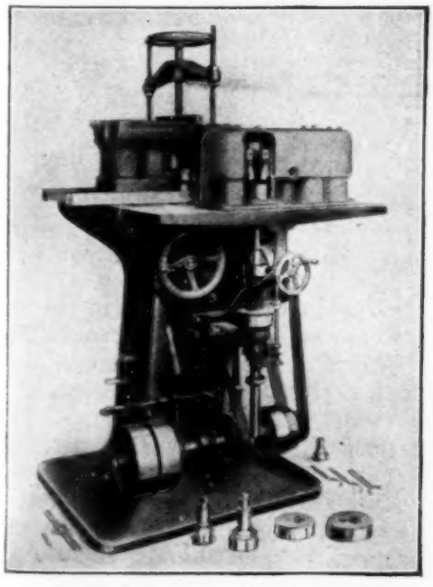


FIG. 2—MODEL-R HEAVY-DUTY STORMIZING MACHINE

The Model-R heavy-duty machine shown in Fig. 2 is similar in general construction to that described on page 289, Vol. 53 of *American Machinist*. However, a finishing spindle unit, such as just described for the finishing machine, is incorporated in an inverted position. There are thus two spindles, one for the boring operation and one for the honing operation. The capacity of the machine is for diameters from 2⅝ to 12 in. and up to 20 in. deep. Either belt driven or motor-driven machines can be furnished. The height to the top of the table is 44 in. The working table is 24 by 30 in. in size and the finishing table 12 by 40 in. The machine occupies a floor space of 36 by 40 in. and has a shipping weight of 1,200 pounds.

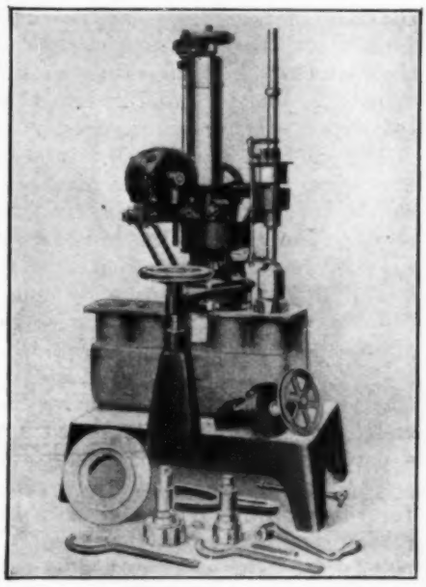


FIG. 3—MODEL-M SEMI-PORTABLE STORMIZING MACHINE

A smaller machine, designated as the Model-M semi-portable Stormizing machine, is illustrated in Fig. 3. This machine, which was described in its original form on page 612, Vol. 55, can be employed either on its stand, as illustrated, or it can be removed and fitted to motor cylinders that are left in place in the chassis of the automobile. As shown, the machine is equipped with a ¼-hp., 110-volt a.c. motor and takes up a floor space of 24 by 29 in. The machine may be driven from a drilling machine or similar machine, if motor drive is not desired. An arrangement of this sort employing a drilling machine was illustrated on page 1,016, Vol. 54 of *American Machinist*.

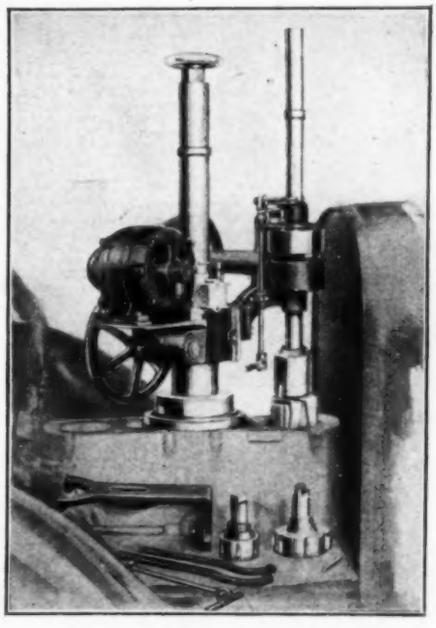


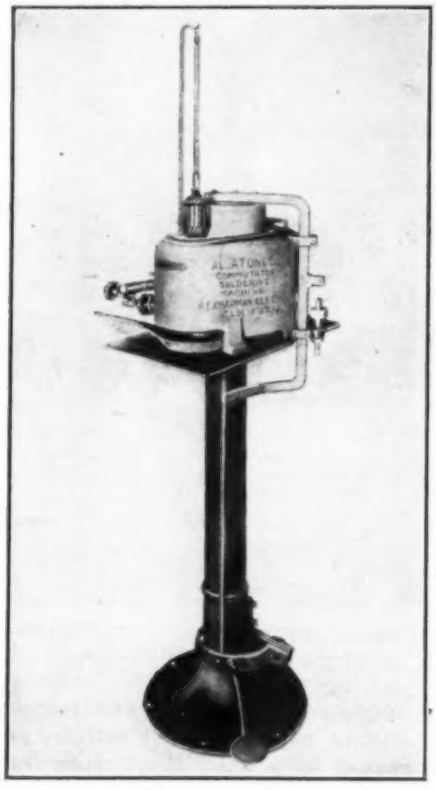
FIG. 4—MODEL-S PORTABLE STORMIZING MACHINE

The Model S portable machine is for work on cylinders while the motor block is in place in the chassis. The unit is merely clamped to the top of the block and a clamping bolt is passed down through the cylinder to hold it. The unit is driven by a ⅛-hp. electric motor. Two cutter heads are ordinarily furnished, to give a capacity from 2⅝ to 4½ in. The shipping weight is 125 pounds.

Chapman "Allatonce" Commutator Soldering Machine

The accompanying illustration shows a production machine recently placed on the market by the P. E. Chapman Electrical Works, 10th and Walnut Sts., St. Louis, Mo., especially for soldering the joints of small commutators. The machine is called the "Allatonce" soldering machine, because with it all the joints on a commutator, rotor or on the end of a container are soldered at one time. The construction of the machine is such that it can be employed wherever production soldering work of a nature similar to that mentioned is to be performed.

No hand soldering with a soldering iron is employed, but a large volume of melted solder is carried in a bath in the machine. A gas burner is provided, and a protective jacket around the bath prevents undue loss



CHAPMAN "ALLATONCE" COMMUTATOR SOLDERING MACHINE

of heat and protects the operator. The products of combustion may be piped outside the plant.

When soldering commutators of small motors, the commutator is placed in a container arrangement which both holds it and protects the shaft and the ring insulation from contact with the solder. Suitable protective holding arrangements can be provided for rotors or whatever work is being soldered. The height of the solder is then raised by depressing the treadle, so that the solder flows around the portion to be joined and fills all the crevices without the dripping of solder that occurs when a hand soldering iron is employed.

The surface of the solder is automatically cleaned of dross as it is raised to the height of the joint. A stop is provided on the treadle mechanism to enable bringing the solder to the proper level and to prevent flooding it back of the commutator. Features of operation of the machine are the speed, the uniformity of the work produced, and the fact that short circuiting of the armatures due to solder running in the wrong place does not occur.

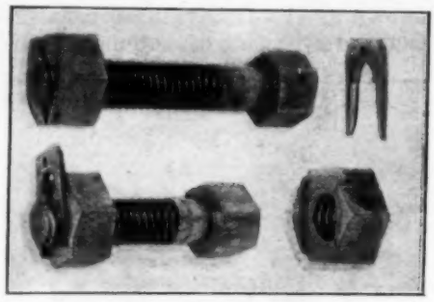
The machine is ordinarily made in two sizes, although larger machines can be furnished to suit special purposes. The smaller machine has a capacity for commutators from ¾ to 2 in. in diameter and up to 2 in. long. The machine occupies a floor space of 15 x 18 in. Its net weight is 130 lb., and it holds about 30 lb. of solder. Crated for domestic shipment the weight is 200 lb., while boxed for export it is about 300 pounds.

The Size 2 machine has a capacity for commutators from 2 to 4 in. in diameter, and up to 3 in. long. It can be supplied for soldering two commutators at once. The machines are provided with guarded double-scale thermometers, and can be provided with 18 x 18 in. work tables fitted to each side.

Rose-Albin Safety Locknut

The Specialty Manufacturing & Sales Co., 171 Lexington Ave., Brooklyn, N. Y., has just placed on the market the locknut shown in the illustration. It should be noted that the nut, which is sold under the name of the Rose-Albin safety locknut, does not require that a hole be drilled through the bolt in order to secure it. The nut proper has a slot in the top of it, in which can be fitted a clip or pin such as illustrated. After the clip is slipped in place on the nut, the two ends of the fork are pinched around the thread of the bolt.

It is stated that a tight grip is obtained on the thread that prevents the nut from turning, although no damage is done to the threads themselves, and furthermore, that the nut cannot be taken off the bolt while the clip is in place without actually destroying the thread. Removal of the clip is easy when it is desired to remove the nut. The nut can withstand vibration as well as twisting



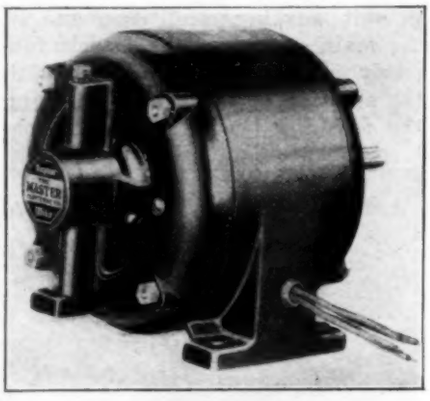
CONSTRUCTION AND OPERATION OF ROSE-ALBIN LOCKNUT

strains without loosening, so that it is safe under practically all working conditions.

The nuts can be furnished in all standard sizes up to ¾ in., and on special order in any size required. If desired, they can be made of special material and case-hardened.

Master Small Electric Motors

The Master Electric Co., Dayton, Ohio, has just placed on the market an electric motor made in sizes from ¼ to 1½ hp. As shown in the accompanying illustration, the distinctive



MASTER ELECTRIC MOTOR

feature of the appearance of the motor is the symmetrical frame. The construction is the same at the commutator end as on the end from which the shaft projects. The frames are interchangeable for alternating or direct current use. Other features of the motor are the compact short-circuiting device, the removable self-aligning phosphor-bronze bearings and the dual wick oiling system.

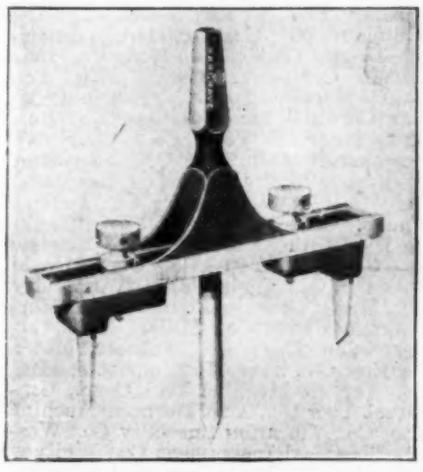
For alternating-current, induction motors for both single-phase and polyphase circuits can be furnished. Compound-wound motors are made for direct-current use. When desired, motors up to 2 hp. can be furnished for high-speed work. Motors as small as ⅛ hp. can be supplied. The motors are intended chiefly for individual drives on electrical appliances and machines of all types.

The maker states that the chief characteristic of the repulsion induction type motors is the high starting torque and the low starting current required. The motors are capable of withstanding heavy overload and of giving service under low-voltage conditions. It is stated that a fuse which will carry the current required for starting the motor will give adequate protection while the motor is running.

Hargrave Circle Metal Cutter

The Cincinnati Tool Co., Norwood, Cincinnati, Ohio, is now manufacturing under the trade name of Hargrave, the circle or washer metal-cutting tool shown in the accompanying illustration. The tool is intended for cutting circular holes in sheet metal, wood or fiber. The body of the tool is malleable iron, and the blades of tool steel tempered and ground for metal cutting. Adjustment of the positions of the blades can easily be made after loosening the thumbscrews that serve to lock them in position.

Two models of the device are made, one with a center guide pin as shown, and the other with a center drill for drilling holes. The capacity of both models is circles from 1 to 4 in. in diameter up to ⅜ in. deep.

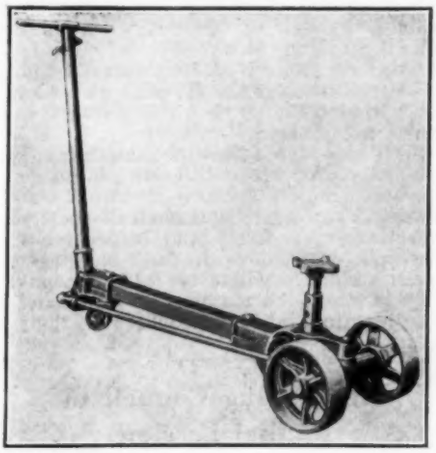


HARGRAVE CIRCLE METAL CUTTER

Weaver "New Way" Model B Garage Jack

The "New Way" Model B jack recently placed on the market by the Weaver Manufacturing Co., Springfield, Ill., is intended especially for lifting and transporting automobiles in garages and service stations where it is necessary to maneuver the machines sideways. The jack is both heavier and longer than the Model A machine formerly made by the concern, and its mode of construction makes it easier to disassemble in case adjustments or replacements are required in any parts.

The lifting standard can be telescoped, and provides heights from 8 to 17½ in. The inner standard can be secured at three heights for work in different ranges. For ordinary elevating, a sufficient height range is provided by means of the ratchet operated by raising and lowering the main handle of the jack.



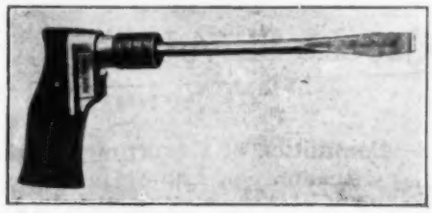
"NEW WAY" MODEL B GARAGE JACK

The front of the jack is supported on two wide-faced wheels that run on an axle held in ball bearings in a pivoted housing. The whole front axle can be swung by turning the bar at the top of the operating handle. Since the rear of the jack is supported on a ball-bearing caster, the jack can be easily guided and manipulated, in order to move an automobile to any required position on the floor.

The jack is applicable to use under either front or rear axles of automobiles or trucks, and is of sufficient size to be used from the side of the car when necessary. The handle normally is held in an upright position by means of a spring. The leverage provided in the mechanism is such that the load can be easily lifted and lowered. The maximum lifting capacity is 5,000 pounds.

Hargrave Pistol-Grip Ratchet Screwdriver

The Hargrave pistol-grip ratchet screwdriver shown herewith is made by the Cincinnati Tool Co., Norwood, Cincinnati, Ohio. The grip is so shaped as to fit and not to tire the hand, and it gives sufficient leverage to turn tight-fitting screws. Easy running screws may be quickly turned by means of the knurled ferrule without taking the hand from the pistol grip.



HARGRAVE PISTOL-GRIP RATCHET SCREWDRIVER

Blades of two widths and a reamer are regularly furnished with each tool. The blades can be changed without making adjustments on the tool. Blades may be had in 3, 4, 6, 8, 10 and 12 in. lengths.

Urges Increase for Navy Yard Clerks

Urging at least 25 per cent increase in the salaries of clerical employees in the Navy Yard to rectify the disproportionate cut in their pay last year, Luther C. Steward, President of the National Federation of Federal Employees, last week appeared on behalf of that organization before the Navy Department Wage Board. Navy Yard clerks who have to qualify by tests of education, training and experience are at present paid less than the man who pushes a wheelbarrow, he declared.

The Board is sitting to consider the recommendation of local wage boards as to wage schedules for all of the Navy Yards and stations in the United States, and is hearing the case of the employees by occupational groups. Mr. Steward presented also the case of the Navy Yard policemen, and on behalf of all employees of the Honolulu and other insular Navy stations, where geographic and climatic conditions impose special hardships, he asked for a 25 per cent wage differential.

"The clerical force always suffers from the indefiniteness of the term clerk," said Mr. Steward, "and this is especially true when Government salaries are fixed by comparison with salaries for similar work in private employment. In few places outside of the Government service is one of the chief executive officers termed a Chief "Clerk" and the duties of any kind of a "clerk" may be quite different in one kind of business or even in one office of the same kind and another. So far as the information before this Board is concerned the clerks are at the mercy of the person who furnishes the outside data. Nobody on the outside can tell whether the jobs are comparable."

News Section

Czecho-Slovakia Adopts American Methods of Scientific Management

Committee of Government Officials and Faculty of Mazaryk Academy of Labor Have Started to Institute the Gilbreth "One Best Way to do Work"

An unusual tribute has just been paid to an American engineer. The Republic of Czecho-Slovakia, through a committee composed of government officials and members of the faculty of the Mazaryk Academy of Labor, has decided to adopt the methods of Frank B. Gilbreth, Inc., in discovering and teaching the "One Best Way to do Work," as Mr. Gilbreth's well known slogan has it. The decison to adopt the Gilbreth methods of scientific management, which are described in a series of articles now running in the *American Machinist*, is the result of Mr. Gilbreth's visit to the new Czech republic last year and of the efforts of the Czecho-Slovak minister to the United States, Dr. B. Stepanek, and his technical adviser, Mr. Stan Spacek.

Under a plan worked out by Mr. Spacek, Dr. Stepanek has been having Mr. Gilbreth send various samples of high grade American tools to Czecho-Slovakia from time to time. Among the manufacturers who have already cooperated in this work are: Stanley Rule & Level Plant, Fayette R. Plumb, New England Butt Co., a leading typewriter company, manufacturers of adding and calculating machines, office devices and equipment, pumping machinery, forges and foundries, with more to follow.

The plan is to study the one best way in each line.

Gilbreth Well Received

Mr. Gilbreth has always been deeply interested in management and in the construction and use of tools and was, consequently, received with open arms at the Mazaryk Academy of Labor where employers, managers, engineers and mechanics assemble to discuss the problems of management, industry and articularly the tools used. The Czecho-Slovaks are eager to get the best in tools and methods from all over the world and adapt them to their own uses. Starting out as they have with all the cards on the table and everybody sitting in from the president down, they will undoubtedly be markedly successful.

It may well be imagined that people who have spent so much thought on the subject of management and the transference of skill would show considerable discrimination in selecting any particular method or tool as a standard to be adopted. Hence the selection of Mr. Gilbreth's management methods and system is most flattering.

Letters recently received by Mr. Gilbreth give the names of the committee members including President Klir of the Mazaryk Academy and Dr. Zimmler, Dr. Ruzek, head of the psycho-technic laboratory, and the heads of the government departments of Public Works and Public Hygiene.

They also say that translation into Czech of the Gilbreths' books, Motion Study, Primer of Scientific Management, Fatigue Study, Applied Motion Study, Psychology of Management and Motion Study for the Handicapped, has been completed, so that the instruction work can proceed.

It is also stated that the plans include publicity for the Gilbreth methods through motion picture theatres, discussions at various technical society meetings, in schools and before labor unions. College professors, engineers and mechanics will come to this country to study the methods at first hand in order to qualify as teachers on their return.

Engineering Council in Annual Session

At the annual meeting of the American Engineering Council held at the Cosmos Club, Washington, D. C., January 11 and 12, Dean Cooley, president of the council, laid special emphasis upon our relations with foreign countries and the possibility of an engineering congress to be held in China.

There were in attendance about 60 members of the council and M. E. Cooley was re-elected president, Calvert Townley, Phillip N. Moore and Gardner S. Williams, vice presidents, H. E. Howe, treasurer. Several committees made their reports and the subject of publicity came in for a long and exhaustive study. The question of publishing a bulletin and also of extensively advertising the council were discussed and it was decided to leave the matter up to the Executive Board.

At the dinner held Thursday evening at Chevy Chase the following speakers were heard: John James Tigert, U. S. Commissioner of Education; Calvin W. Rice, Elmer M. Sperry and Prince Celasio Caetani, Italian Ambassador.

Automotive Exportation

Motor trucks to the value of $604,875 were exported during November, while during November a year ago, the total was only $368,120 for the same classification. These include buses as well as motor trucks for heavy hauling. There were passenger cars to the value of $4,145,779 exported in November, 1922, and in November, 1921, there were only $1,847,190 worth.

Many Machine Tools Shown at Auto Show

With four floors of the Grand Central Palace filled with automobiles, accessories, parts and automotive making and repairing machinery, the twenty-third annual Automobile Show held from Jan. 6 to 13 inclusive, was declared to have been the most successful show that has been staged in the history of the industry. New models, models that have been slightly altered, accessories with tendencies to save automobile owners time, labor and money, machinery for grinding, boring and honing cylinders, heavy machinery for lifting and repairing automobiles and hundreds of other interesting sights were presented by the many exhibitors who displayed their wares at the booths.

The Chevrolet car with its "copper cooled" feature seemed to have attracted the most attention. Situated at the very entrance of the show, one of the most advantageous places in the entire building for an exhibitor, the Chevrolet booths presented a busy sight at all times when the doors of the Palace were open. The copper cooling is similar to the air cooled feature of the Franklin Car in that neither car needs water.

The Cadillac and Buick booths were also well populated during the sessions and on the messanine floor both the Locomobile and the Stanley car attracted big crowds. New features were displayed by the Mercer, H.C.S. and the Stutz cars, all three having branched out into the six cylinder class this year whereas in previous years they have stuck to the four cylinder models.

Machine Tool Exhibits

Perhaps the greatest interest aside from the new models of automobiles for the machinist visiting the show was the great number of machine tool manufacturers who had exhibits on the fourth floor of the building. The following firms were among the exhibitors:

Alloy Foundry & Machine Corp., Aluminum Die-Casting Corp., American Bronze Corp., Auto-Hone Co., Inc., Barnes Company, Bassick Mfg. Co., Baush Machine Tool Co., Bowen Products Corp., Brown-Lipe-Gear Co., Bullard Machine Tool Co., Champion Pneumatic Machinery Co., Cleveland Pneumatic Tool Co., Covert Gear Co., Inc., Doehler Die-Casting Co., Eclipse Machine Co., Foster Machine Co., Franklin Die-Casting Corp., General Electric Co., Greenfield Tap & Die Corp., Heald Machine Co., Light Mfg. & Foundry Co., Manufacturers Foundry Co., Merchant & Evans Co., Millers Falls Co., Perfection Gear Co., Pioneer Motor Bearing Co., Shore Instrument & Mfg. Co., Triplex Machine Tool Corp., Universal Tool Co., Van Norman Machine Tool Co., Vibration Specialty Co., Weston Electrical Instrument Co., Whitney Mfg. Co., K. R. Wilson and Wyman-Gordon Co.

Automotive Engineers Hold Annual Meeting

Well attended standardization committee meeting opens conference—Particular attention given to fuels, research and body construction — Extra tables put in at banquet

IN ACCORDANCE with the usual custom, the annual meeting of the Society of Automotive Engineers in New York was opened on Tuesday morning, January 9, with the session of the Standards Committee. The meeting was late in starting because of the difficulty of collecting a quorum at ten o'clock, but before much progress had been made enough members had arrived to make it one of the best attended sessions that has been held.

A clear indication of the antipathy of American manufacturers to metric measurements was given by the minority report of the Ball and Roller Bearing Division recommending an "S. A. E." standard for metric size ball thrust bearings. Letters from Brown & Sharpe and the Pratt & Whitney Co., were read in support of the opinion of the minority report. It was brought out in the discussion that the number of metric thrust bearings manufactured in the United States is but a small part of the total thrust bearing production, that inch-size standards have been in existence for years and that no harm would be done by adopting a standard for the few metric bearings manufactured. The objections were not over-ruled, however, and the report was referred back to the committee, the motion for adoption being lost.

Standards adopted by the committee, subject to approval of the membership by letter ballot, included: revisions of the dimensions for generator flange mountings, inboard type starting motor flange mountings, magneto mountings, dimension across flats of spark plug shells, fly wheel housings, two editorial corrections on the iron and steel specifications, rating of incandescent lamps for automobile head lights, specifications for crankcase lubricating oils, nomenclature of differentials, plain washers below ¼ in. diameter, one change in rod end dimensions, revision of roller chain strengths and dimensions.

Simultaneously with the afternoon session of the standards committee, a body engineering session was held at which papers on "Automobile Finishing Varnish" by L. V. Pulsifer and on "Needless Hardwood Lumber Waste" by F. F. Murray were presented. The first paper was illustrated by actual laboratory demonstrations and the second by motion pictures.

Aeronautic Session

Commercial airplane design occupied the evening aeronautic session, Prof. E. P. Warner presiding in place of V. E. Clark, and also contributing largely to the discussion. The others who contributed to the symposium were G. G. Peterson of the Wright Aeronautical Co., Frank H. Russell of the Curtiss Co. and Harry Bruno of Aeromarine Airways. Archibald Black and Chas. Manly aided in the discussion.

The great problem seems to be to keep our airplane building organizations together until the commercial use of planes utilizes their capacity. At present only the army and navy are customers with an occasional private order, the total number built in 1922 being pitifully small. We should have more efficient mail planes to replace the modified military planes now in use.

The trend toward closed bodies as evidenced at the show, was reflected in the papers at the second body engineering session on Wednesday afternoon. George J. Mercer gave an illustrated paper on "Reducing the Cost of Enclosed Bodies," in which he showed the use of wire netting and plastic material for rounded back corners and similar work. A paper by J. B. Davis dealt with the "Testing of Leather Substitutes and Top Material."

In the detonation session, there was an exhaustive paper on "Internal Combustion Engines under High Compression" from tests made at Purdue University by J. H. Holloway, H. A. Huebotte and G. A. Young. The discussion brought out the desirability of stating an exact analysis of fuel used in such tests as fuel changes from year to year lessened the value of such papers for reference unless this was done. Thomas Midgley, Jr., of the Dayton Research Laboratories told of their work on fuels for the prevention of knocking in motors. Stephen M. Lee and Stanwood W. Sparrow presented a paper on Testing Fuels for High Compression Engines.

Business Session

The attendance at the business session Wednesday morning was rather meager as is usual in most societies. The total membership has dropped slightly since last year, but the society is healthier because of it. The great rush of war work brought in many who are no longer interested in automotive work and these have been practically weeded out. The work of securing new members has been so successful that the resulting loss in numbers has been practically overcome. The finances are satisfactory considering all phases of the society's activities.

The research session on Thursday morning was presided over by B. B. Bachman. Henry Crane, chairman of the Research Committee made a verbal report in which he deprecated the tendency of the automobile industry to build high speed motors requiring large valves, passages and ports and low carburetor depression in accordance with aviation practice. He said that such design requires a fuel more volatile than any we are likely to get in the future.

The work of the committee since the semi-annual meeting has consisted of two sets of tests run on four different fuels by the Bureau of Standards and by ten manufacturers. Four different cars in common use were used by the Bureau of Standards' engineers in their tests and the results obtained corresponded very closely with those reported by the company cars handled by ordinary drivers.

The report of the Bureau of Standards tests was presented by R. E. Carlson of the Bureau and the report on the performance of the cars owned by the co-operating companies was presented by V. H. Gottschalk, engineer of the Society's research staff.

The social function of the meeting was the annual banquet held Thursday evening at the Hotel Pennsylvania. Well over a thousand men sat down to dinner under the genial guidance of the toastmaster, C. F. Kettering. The retiring president, B. B. Bachman, introduced the toastmaster who paid his respects to the industry and the automobile show in his usual witty manner.

Elisha Lee on Railroads and Motor Transport

The principal speaker of the evening was Elisha Lee, vice-president of the Pennsylvania Railroad, who delivered an excellent address on Motor Transport and Our Railroads. Mr. Lee gave it as his belief that the function of the automobile is to add to the utility and efficiency of the railroads rather than supersede them. That it should not attempt to do what the railroads do well and economically, but what they do poorly or not at all. The railroad is economical for long haul mass transportation where the motor truck cannot show a consistent profit. The motor truck on the other hand shines in short haul feeder type transportation of l.c.l. freight.

Mr. Lee expressed the opinion that an organized motor truck service for the collection and distribution of l.c.l. freight would be a great advance over the present haphazard methods and would supply a valuable express service midway between existing express and freight transportation. Certainty and dependability would be increased and losses, transit time and capital invested by merchants and manufacturers would be reduced. The speaker inclined to the belief that such a service should be individually operated rather than controlled by the railroads as the railroad managements have as much as they can handle now and less restrictive regulations would be likely under private ownership. Further study must be put into the subject of the type of freight container to be used.

The final speaker was the new president of the society, Col. Herbert W. Alden, chief engineer, Timken-Detroit Axle Co. Col. Alden, in reviewing the progress of the society during the past year, said that the production session held at Detroit in October was one of the most successful and best attended meetings ever held and would be followed up by an intensive effort to develop the productive side of the industry in the society. He seconded Mr. Bachman's recommendation that most of the technical session be divorced from the annual meeting and held at some other place at some other time. The diversions of New York City during show week afford too great competition for technical sessions of the society and it was therefore intimated that the annual meeting would consist only of the business meeting, perhaps one technical session and the dinner.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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THE MARKETS changed but little last week. The world—and particularly the American business world—is awaiting with interest and suspense the result of the French effort to coerce Germany. The people of the United States sympathize with the French in their fear of another German invasion, but they doubt the success of the French method of collecting debts by impoverishing the debtor. There is, however, an almost fatuous belief that the present involvements will somehow be straightened out and this may explain the complacence with which the somewhat ominous outlook is regarded.

The dollar bonds of France and Belgium that are held in the United States have declined as was to have been expected, and French and Belgian francs have likewise fallen. Marks have also dropped to a new low level, being now quoted as hardly more than 9 cents a thousand. At this price, their value as an international medium of exchange is negligible though they still have more or less purchasing power in Germany.

Sterling on the other hand has been surprisingly steady in the face of the foreign complications, largely because the English commissioners now here to discuss the British debt to our Government have won the unanimous approval of the financial community by the straight forward courage with which they have approached the subject.

But aside from the fluctuations in foreign exchange and foreign bonds the security market does not call for much comment. Stocks have been quiet and some large offerings of newly issued bonds have been successfully disposed of. This is especially true of the tax exempt obligations brought out on behalf of the various Federal Land Banks. The avidity with which these and other tax exempt securities are absorbed by people of large wealth is in fact one of the disturbing features of the situation as it tends to reduce the government revenue from the income tax and make it increasingly difficult for private enterprise to get the capital it requires.

Secretary Mellon is wisely emphasizing this view, but his utterances are unheeded by a Congress which, contrarily enough, otherwise seems bent on taxing capital wherever it can be reached. There is indeed a grave possibility that the radical Senators will force a re-enactment of the excess profits tax before the year it out, forcing the Administration to acquiesce by the threat of even more disturbing legislation.

The commodity markets have fluctuated within narrow limits. Our internal trade is about normal, for there is and will be nothing to create unusual activity as long as the possible disintegration of Germany impends.

This may be a blunt statement, but there is no use blinking the facts.

Before the war, the market for our surplus production included 180,000,000 Russians, as well as 65,000,000 Germans. We have been cut off from Russia for some time and if a political revolution or uprising in Germany shall result in the disruption of the present German Republic our trade with Europe will be still further reduced. The so-called "Ruhr" which is really the valley or basin of the River Ruhr, is almost the industrial heart of Germany. Its occupation by the French will greatly discourage the German people and seriously reduce their producing power.

> "The dollar bonds of France and Belgium that are held in the United States have declined as was to have been expected and French and Belgian francs have also fallen. . . . Sterling on the other hand has been surprisingly steady in the face of the foreign complications. . . . There is a grave possibility that the radical Senators will force a re-enactment of the excess profit tax."

For these reasons, it is to be hoped that some way may be found to avert a contingency whose consequences may be so depressing and, until the outlook is clearer, caution seems to be advisable.

Robert Dollar, the well known San Francisco merchant and shipowner, has said that the time is not far distant when our trade across the Pacific will exceed our trans-Atlantic commerce.

It may be that he is right and that what is now happening in Europe is hastening the day of which he spoke. The people of the United States are in every sense sufficiently resourceful to adjust themselves to any change, but all readjustments involve stress, and stress is not consistent with what is called prosperity.

In so far as the details of our domestic situation are concerned, they are about as usual. There is enough to worry about, but nothing to cause immediate concern. The coal supply is meagre and badly distributed, but it looks as if we shall worry through the winter without acute distress. The operatives in the New England textile mills are threatening to strike in the spring unless their wages are advanced, and the outlook is by many considered grave, but some employers show a disposition to meet their employees half way and it may be that serious trouble will be averted.

The railroad congestion has been partially relieved and net earnings make a rather better showing. Continued improvement in the steel industry is reported and those who ought to know predict great activity in the building trade when spring opens.

Cotton, like other commodities, has been unaffected by the developments in Europe and made new high prices for this crop, while the French were marching into Essen, and fear of a "buyers' strike" which ruled much of the trade not long ago seems to be receding into the distance. The grains also are steady and the various cottonseed products are attracting attention by their advancing prices, which reflect improved demand as much as scarcity of seed.

Wool, tin, the lesser metals and nearly all other commodities are firm. The expected decline in sugar under the impact of the new crop has not yet materialized to any extent, and if we could be sure that our consumption this year would equal the 102 pounds per capita which, it is now announced, we used last year, no great decline could be looked for. Sugar has shown that a surplus of any widely used commodity can be very quickly transmuted into a scarcity, and rubber, which has advanced to above 30 cents in New York, is now illustrating the same process. The strength of the petroleum market in the face of the largest output in our history is also worth noting; it probably reflects the general expectation that 1923 will be our greatest automobile year up to this time.

Reports from industrial centers indicate that wages are slowly rising and from the agricultural districts they tell of increases in the farmers' purchasing power and growing optimism among all who sell to them.

The weekly statement of the Federal Reserve System shows an increase of $13,000,000 in the gold held, a reduction of nearly $100,000,000 in circulation, and a decrease of $145,000,000 in discounts. As a result chiefly of these changes, the reserve ratio has risen from 71.3 per cent to 73.6 per cent.

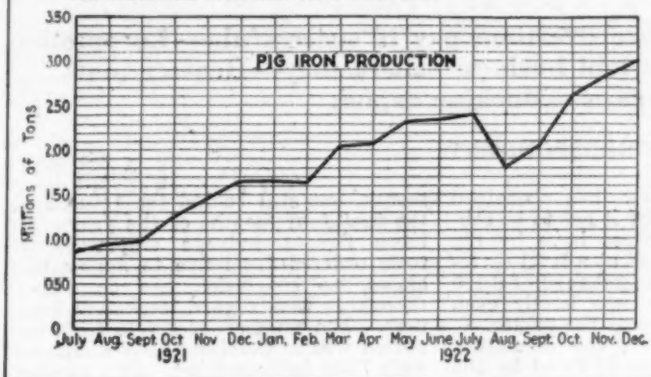
It is in fact possible that the plethora of credit indicated by these figures explains the paradoxical steadiness of the markets in the face of the unsettlement overseas, and that the inflation which has been so long expected as a consequence of our enormous gold holdings is at last making itself felt.

Youngstown Tube Co. Buys Another Company

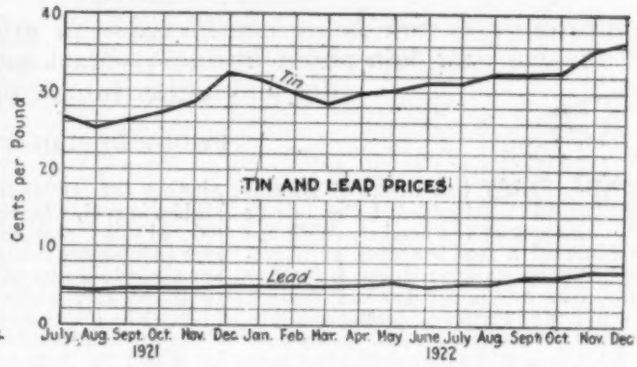
President J. A. Campbell of the Youngstown Sheet and Tube Co., has announced that the company has purchased the assets of the Steel and Tube Co. of America. Recently the Youngstown Co. purchased the Briar Hill Steel Co. and the combination of the three makes the gross assets about $250,000,000 and outranked only by the Bethlehem and the United States Steel Corporation.

The combination will be the largest independent steel pipe maker in the world and the annual output will be a million tons.

Monthly pig iron production of all coke and anthracite furnaces in millions of tons, based on returns compiled by the American Iron and Steel Institute.



Monthly average price of tin and lead in the New York market, based on returns furnished by Engineering and Mining Journal-Press.



PIG Iron Production for the first time since October, 1920, reached and exceeded the three million ton mark in December. For several months the production has been steadily climbing and it reached a high point for the past twenty-six months with a total of 3,086,898 tons for the thirty-one days. The average daily output was 99,577 tons. During November, the output was 94,990 tons a day, with a month's total placed at 2,849,703. Pig iron production during the year was high and has been estimated as 27,005,500 tons as compared with approximately sixteen and a half millions in 1921. During the last month of 1922, fifteen furnaces blew in and four blew out making the total active on the New Year 253 as compared with 242 that were active on the first of December.

The lead and tin market remained steady during the month of December and but little change is expected during the coming month. Lead is quoted at New York as 7.163, St. Louis at 6.978 and London 26.079. An excellent Spring business is anticipated in the lead centers and at that time a price advance will probably be in evidence. During December, sales were not particularly active, but prices were well maintained. Most of the 99 per cent grade tin offered during the month was of Chinese origin. The total arrivals of tin during the month in long tons were as follows; Straits, 1,035; China, 85, Java, 325. This is a nominal amount.

Comparative Prices of Shop Supplies

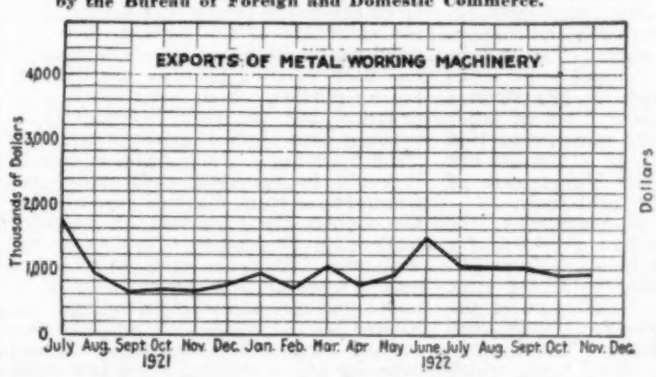
Average of New York, Chicago and Cleveland Prices

	Unit	Current Price	Four Weeks Ago	One Year Ago
Soft steel bars	per lb.	$0.0296	$0.0295	$0.0258
Cold finished shafting	per lb.	0.0378	0.0375	0.0337
Brass rods	per lb.	0.1742	0.171	0.1516
Solder (½ and ½)	per lb.	0.2425	0.24	0.2058
Cotton waste	per lb.	0.1175	0.11	0.10
Washers, cast iron (⅛ in.)	per 100 lb.	4.33	4.33	4.50
Emery, disks, cloth, No. 1, 6 in. dia.	per 100	2.96	3.11	3.20
Lard cutting oil	per gal.	0.5583	0.59	0.55
Machine oil	per gal.	0.36	0.36	0.40
Belting, leather, medium	off list	49%	37%	44%
Machine bolts up to 1 x 30 in.	off list	51⅛%	52%	58%

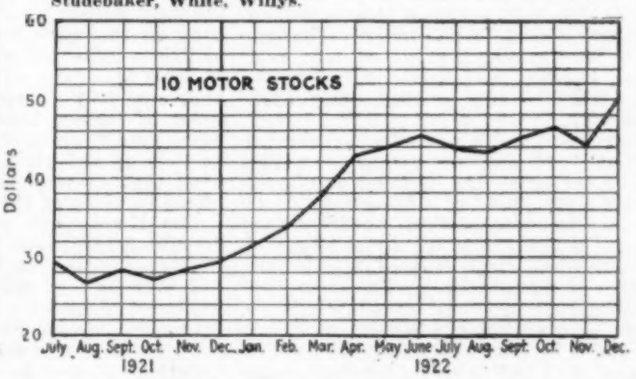
Exports of metal-working machinery during the month of November were valued at $926,993, which was a slight increase over that of October and a material increase over the exports of November, 1921. In 1921, the amount was $672,810. Reamers, cutters, drills and other parts for machine tools led the other classifications with a total of $80,303. Sharpening and grinding machines totaled $72,460, boring and drilling machines are listed at $57,670, while pneumatic and portable tools were fourth with total exports amounting to $53,753. The general trend of exportation of these classifications has been particularly steady for several months and it is anticipated that there will be but little change for several months to come.

Motor Stocks took a big jump this month and have regained the position which they formerly held among other investments. No good reason can be found for the sharp advance, unless the possibility of the Show season may have had its effect and the better financial condition of the country generally may also have added its influence. Stewart Warner showed speedometer activity during December at 80¼, whereas in November the average was 57 and during October it was 53. Since the first of the year, it has shown further activity and is quoted a few points higher than the above figure. Chandler also showed an advance of seven points and the Mack International Motors advanced nearly eleven points during the month.

Total value of all metal working machinery exported monthly from the United States, based on returns compiled by the Bureau of Foreign and Domestic Commerce.



Average price of ten automotive stocks: Chandler, General Motors, Hupp, Int. Motors, Pierce, Stewart, Stromberg, Studebaker, White, Willys.



Germany May Abolish Eight Hour Work Day

Compromise is now being considered—No more overtime pay if successful — Locomotive makers complain about business—Machine tool business satisfactory—Heavier tools demand higher rate of prices—Machine export

BY OUR BERLIN CORRESPONDENT

THE FIRST two weeks of December have accentuated the falling tendency of the market. With the exception of a few branches of industry, business has experienced a further drop. New orders for domestic sources as well as for export are diminishing in numbers as well as in size. Moreover, it appears from a number of reports of local chambers of commerce, that the tendency to retract on orders booked, on the side of the buyers is becoming stronger. The only prominent exception is the machine building industry—at least several important lines of it—although a gradual decline can there be observed also. Excepting a few branches of the machine building industry, which, like the locomotive industry, are complaining of slack business, the present employment, as well as the amount of new business coming in, may be described as normal.

No Rush of Business

Of the great rush experienced in the earlier and middle part of the year hardly any traces are, however, left anywhere. The demand has lost force and uniformity. With the exception of the market for raw material, like, for instance, iron and steel, hardly any pressure is visible. As an explanation of this state of affairs, almost unanimously the contention is put forth, that prices have reached the so-called world market level and even exceeded it. The market is by no means saturated. A strong, but latent, demand still exists under the surface, checked by the level of prices, which has got out of its proper relation with the purchasing power. To this has to be added the constant fear, in which the business world is kept, of a strong improvement of the mark exchange, kindled by a campaign of optimism in the press. This campaign doubtless has a twofold object: to help the financial manipulations, which are being carried on in the interest of supporting the mark exchange and to check the upward movement of prices. In the latter respect, they have so far failed entirely. As an illustration of the strong momentum, which is still inherent in this movement, it may be mentioned the experience lately made on the iron and steel market. While for raw material prices, which are now keyed to the mark exchange, have been reduced, prices of iron and steel, finished and semi-finished products, have almost simultaneously been increased.

For weeks past, in fact since the installation of the new government, the mark exchange has been kept almost stable, even showing a tendency to improve. In spite of that, hardly a day passes, without bringing a rise of prices of material, even such of the lowest stages of manufacture. The index figure for coal, iron and metal, which on Nov. 17 was 1,500, has arrived on Dec. 2 at 2,200 in the face of an improving tendency of the rate of exchange. The only raw product, which since the beginning of December has remained stable, is coal, whereby it has to be considered that coal prices have by the last adjustment settled at a level corresponding to a rate of exchange of 8,400 to the dollar, which was barely even reached in the course of the month.

As an illustration of the difficulties, by which the industry is faced by the price movement, it may be mentioned that semi-finished products of mild steel of French origin can be bought in Germany at 420 francs per ton equaling at the average rate of exchange 230,000 marks, while the German inland price for the same product is 318,000 marks for the open hearth quality. This discrepancy is caused by the falling market in the other steel producing countries. The German inland price for machine building material is higher than outside of Germany, which places machine builders at a considerable disadvantage—especially with regard to heavy machinery. From returns of foreign trade, it can be seen that the drop experienced in recent months mainly falls to the share of heavy types. Cases, that such machinery is sold for abroad at lower than the German domestic prices, are not infrequent.

Machine Tool Business Good

The machine tool business is in the main still satisfactory as far as the employment of the industry is concerned. The new demand is, however, showing a marked tendency to discriminate in favor of leading makes and within these between standards and single purpose types or specialties. Only with regard to the latter the demand still continues in a satisfactory degree. Standard tools are getting more and more neglected, especially lathes, small turret lathes and plain milling machines. Prices have been raised four times since November 1. A further rise is expected to come out in the next days. The following figures show these rises expressed in per cent of the price of November, 1921. Prices have reached a level of from 1,500 to 3,000 marks per kg. at an average rate of the currency to parity of 1,800:1. The margin between high class tools and such of the lower order has visibly widened. The quality is, however, not the only factor for the place tools occupy on the scale between the margin of prices indicated above. The weight of tools is almost of equal importance and, curiously enough, in the reverse order of former times. Cost of labor having not risen in the same proportion as that of materials, it is the heavier tools that demand the higher rate of prices in place of the light tools.

For the export of machinery, the definite returns are now available for October showing an increase from 31,012 tons in September to 42,448 tons. All lines of machine building, with the exception of locomotives, have contributed to this increase. Machine tool export amounted to 4,467 tons, which is considerably more than the previous month, but still behind the returns of the first four months of the year. As these figures indicate shipments of tools ordered from five to six months ahead, no conclusion can be drawn therefrom with regard to present business. The number of single tools exported was in October 14,069 compared with 7,133 in September. This number is nearly double, while the increase in weight is only 80 per cent. Still stronger is this difference in comparison to last April, when the weight of machine tools exported was almost exactly the same as in October, but the number of tools only 9,837. A gradual increase in numbers in reverse proportion to weight can be noticed throughout the whole year, indicating the preference given to light tools in export. The average weight per tool was in April only approximately 550 kg. and has dropped in October to 300 kg. Ad valorem the October export of machine tools amounted to 1,110 million papermarks as against 414 million in September. The respective prices per ton were the following:

April	
Price per Ton, Paper Mark 40,400	Price per Ton, Gold Mark 585
September	
Price per Ton, Paper Mark 171,000	Price per Ton, Gold Mark 490
October	
Price per Ton, Paper Mark 248,000	Price per Ton, Gold Mark 330

These figures speak for themselves, but not for the sagacity prevailing in the German export business. As export prices are since months quoted on a firm basis in gold money, the complaints frequently heard of the "too high prices" standing in the way of export business sound rather absurd.

The Proposed Work Hours

In all quietness, almost unobserved in the constant noise raised by the reparation problem and over the questions of loans and stabilization of the mark, an event has taken place of the greatest importance to the German industry, in fact to the country's economical life. In the conflict waged, almost since the peace treaty was signed, over the extension of the working time beyond the eight hours day a settlement has been reached between the two opposing parties, which looks like a compromise, but amounts in practice to nothing less than the abolishment of the 8 hour day. During recent months it could be observed that under the pressure of the disaster threatening the country the resistance of the labor leaders in this matter has gradually weakened. Even the greatest optimists could, however, not have foreseen its rapid and almost complete collapse exhibited by the representatives of labor in the National Economical Council over the deliberations for the law regulating working time. In the draft of

this law, decided already in its main points, the eight hours working day has been reduced to the nature of a standard, which in the light of the many exceptions admitted for its extensions appears merely of theoretical value. These exceptions compass almost all lines of industry and all contingencies, which might call for such extension.

Under the new law, no negotiation will be necessary between the employer and workmen over the question of a working day. It can simply be decreed by the employer, if his case is provided for by the clauses of the law. The representatives of labor proposed that the matter should be left to agreement between the two parties in each individual case and, if such is not achieved, should be submitted to arbitration. This contention was, however, overruled.

NO MORE OVERTIME

That the makers of the law do not look upon the extension of the working time in the light of overtime, but in that of regulation time, is proved by the cancellation of the premium now in force for time in excess of the eight hours day. This time will in future be paid solely at the regular rates. The draft of the law will shortly be submitted to parliament, where its passing appears assured in view of the attitude, which the socialistic leaders have lately exhibited towards it. They maintain that by better organization and management as well as improved equipment just as much work can be produced in eight hours as under present conditions in ten hours, but that Germany had not the money, which would be needed for this reorganization, nor the time to wait until it could take effect. This means that German manufacturers will be able to muddle along the lines of least resistance, as they are doing now, until further necessity arises. Persons in authority, gifted with foresight, are doubtless keeping such necessity in view, and further changes in labor conditions, amounting more or less to a return of the pre-war order of things, are contemplated, chiefly in the direction of the re-establishment of the principle to pay by skill and results. The extension of the working time is intended mainly for the raising of the country's national resources in industry and agriculture. Manufacturers can benefit by it only in times of pressing orders, when they, no doubt, will make large use of it in preference of double shifts. They have been complaining from the start that the eight hours working day does not allow an equally intensive utilization of their equipment, meaning that longer working time is more profitable. They may be trusted to follow up their advantage until pre-war conditions are reached.

Germany's Labor Problem

It will be a long time before Germany regains the former prestige of its highly skilled labor, for the reason that the rigid course of apprenticeship through which young men passed in order to be classified as highly skilled no longer represents an absolute requirement, according to the *Commercial Reports* of the Department of Commerce. The Government, itself, is in part responsible for this situation, as unskilled workers were used to keep industry going during the war, when skilled labor was needed at the front.

Export Prospects Bright Says Rastall

American business in industrial machinery is better than ever before from an export standpoint, according to Walter H. Rastall, Chief of the Industrial Machinery Division of the Department of Commerce. And the future is still more bright if all indications prove true, he further states in an article recently published in the *Commercial Reports* of the Department.

"Reports from Netherlands, Belgium, and Austria indicate that it is difficult now to do business with Germany, and the German handicap will obviously be greater in Asia, Latin America, and other important regions" states Mr. Rastall. "Americans ought to obtain and hold a substantial share of the 44 per cent that Germany once controlled.

"British manufacturers are also encountering serious difficulties. A great many of the machinery plants of the United Kingdom are not really equipped for their present products. Moreover, they have lost many of their best markets, and their business organization has been disturbed in order to develop new ones.

"The foreign demand for American machinery and American expert service is unprecedented. Our prestibe as engineers and machinery builders has been greatly advanced. In 1921 China bought $18,184,978 worth of American machinery, as compared with $260,431 in 1913, while Egypt purchased $1,733,625, against $69,753 in the pre-war year."

Ford Motor Co. Plans Plant for St. Paul

Plans for a ten million dollar plant have been made by the Ford Motor Co. to be located at St. Paul, Minn., adjoining the Government high dam on the Mississippi River. If water power is granted to the company the plant will be as contemplated, but in case this permission is refused, steam or electric power will be used and a smaller plant erected. If the larger plant is opened, it is estimated that 15,000 people will be employed. The Milwaukee railroad will extend its tracks and build a large bridge over the Mississippi direct to the plant, spending approximately three million dollars to accomplish this.

Railroad Equipment is in Better Condition

Locomotives in need of repair on American railroads on December 15 totaled 17,883, which was 27.7 per cent of the number on line, according to reports received from the carriers by the Car Service Division of the American Railway Association. This was a decrease of 126, compared with the number in need of repair on Dec. 1, at which time there were 18,009 or 27.9 per cent.

Locomotives in need of light repairs on Dec. 15 totaled 3,369. This was a decrease since the first of the month of 190. Locomotives in need of heavy repairs totaled 14,514, an increase of 64 since Dec. 1.

The number of serviceable locomotives on American railroads on Dec. 15 amounted to 46,648 compared with 46,525 on Dec. 1. Reports also showed that during the first 15 days in December, 13,381 locomotives were repaired and turned out of the shops, which was slightly under the number turned out of the shops during the last half of November.

Freight cars awaiting repairs on Class One railroads on Dec. 15 totaled 213,837, or 9.4 per cent of the cars on line. This is a reduction of 12,451 cars compared with the number in need of repair on Dec. 1, at which time there were 226,288 or 9.9 per cent.

The number awaiting repairs on Dec. 15 was the smallest since Feb. 15, 1921.

On Dec. 15 last year, 318,556 or 13.5 per cent were in need of repairs.

Cars in need of light repairs on Dec. 15 this year, totaled 44,567, a reduction of 5,715 since the first of the month, while those in need of heavy repair totaled 169,270, or a reduction of 6,736 within approximately two weeks.

Gilbert & Barker Sales Force Changed

The Gilbert & Barker Manufacturing Co., pumps and factory oiling systems, plants, etc., Springfield, Mass., has recently announced the following changes in the personnel of its general sales department. W. C. Leitch, has assumed direct charge of Domestic Sales Division, relieving G. C. Roberts, who has been appointed supervisor over all field activities in the Eastern territory. K. S. Edwards, will have charge of all sales activities in the Central and Southern districts, and E. E. Creed, will have charge of sales in the Western territory, with office at Dallas, Texas. C. W. Kincaid, has been transferred from Dallas, to Baltimore, W. C. Ingram and E. B. Norris, are transferred from the Pacific Coast territory to Chicago, and J. S. Kenney, has been assigned to the San Francisco office.

Jones & Laughlin Corporation Elects Officers

The Jones & Laughlin Steel Co., has been reorganized into the Jones & Laughlin Steel Corporation with offices in Pittsburgh. By an election held Jan. 1 the following officers were elected for the corporation: B. F. Jones, Jr., chairman of the board of directors; William Larimer Jones, president; Willis L. King, G. M. Laughlin, Jr., W. C. Moreland, Charles A. Fisher and S. E. Hackett, vice presidents; B. F. Jones, 3rd, secretary, and J. C. Watson, treasurer.

Safety Engineers to Hold Annual Meeting

The annual meeting of the American Society of Safety Engineers will be held Thursday afternoon and evening, January 18. The Board of Directors will hold a meeting at 2 o'clock in the Engineering Societies Building, 29 West 39th St., New York, and the reports of the president and chairmen of committee will be read. New officers will also be elected at this time.

In the evening, at the Cafe Boulevard, there will be held a dinner for the members, their families and friends and those interested in the society.

Business Items

Directors of the General Motors Corporation at the meeting held January 8, declared the regular quarterly dividends on the 6 per cent preferred stock of $1.50 a share, on the 6 per cent debenture stock of $1.50 a share and on the 7 per cent debenture stock of $1.75 a share. All of these dividends are payable February 1.

Machinery, including horizontal boring machines, engine and boring lathes, presses, shapers, electric induction motors, blowers, exhausters, and many other devices will be offered for sale by the Government at the Augusta Arsenal, Augusta, Ga., January 29. All bids will be opened at 10 o'clock.

Bids will be opened at 11 o'clock, January 31, at the Central Sales Office Navy Yard, Washington, D. C., for a sale of Navy surplus pipe fittings including ferrules, flanges, flashings and gages.

Two prizes have been offered by Alvan T. Simonds, president of the Simonds Saw Co., Fitchburg, Mass., to students in high schools, trade schools and normal schools who submit the best essay on the assigned topic "The lack of economic intelligence and some of the injuries it has caused to individuals and general welfare in the United States since 1860." The prizes are $1,000 and $500.

The Laib Co., Louisville, Ky., has increased its capitalization from $150,000 to $900,000 and has issued 2,000 shares of preferred stock and 5,500 shares of common stock at a par value of $100 per share. The company makes plumbing, heating, and mill supplies.

Fayro Machine and Engineering Co., Johnstown, Pa., announces that the new plant in North Sheridan Avenue is now operating. It is also announced that the company has purchased the Bettermann Boiler Works with Reinhold Bettermann continuing with the Fayro organization as superintendent of the boiler and tank shop.

Employees of the United States Steel Corporation have been given an opportunity of purchasing shares of stock in the Corporation at $107 a share. The offer amounts to 60,000 shares, according to estimate, although the corporation will honor all subscriptions sent in. The price last year was $84 a share and approximately 100,000 shares were sold. Employees are allowed to pay for the stock by installments.

The Foster Machine Co., Elkhart, Ind., has established an office in Room 332, 30 Church Street, New York City. E. H. Warner, who formerly held several managerial positions with the Fairbanks Co., will be in charge.

Berne Nadall, vice-president and treasurer of the Stanworth Tool Manufacturing Co., Inc., a new Indianapolis industry, has announced that the company will probably begin operations by January 15. The plant is at 40-44 West North street. A carload of machinery for making boring tools of all kinds and for use by machinery manufacturing concerns has been received and is being placed in position. Another carload is expected soon. The company has been made a closed corporation with Arthur Stanworth, the president and general manager, and George Kanouse, a well known Indianapolis business man, as the other member. The company has a capital stock of $50,000.

Quarterly dividends of one per cent were declared by Allis Chalmers Manufacturing Co., on its common stock. The dividend is payable February 15 to holders of record January 25. President Falk stated that business had been good for several months and that, although there had been some demand for the company's product from railroads and municipalities, that by far the greatest buying had been by leading public utilities of the country.

The Swartwout Co., Cleveland, Ohio, recently organized by D. W. Swartwout, former president, and W. E. Clement, former secretary of the Ohio Body and Blower Co., has taken over the Orrville, Ohio, plant of the Blower Co., together with the metal stamping business and equipment and has opened a plant in the building formerly occupied by the Cleveland Milling Machine Company.

Announcement is made of the expansion of the Alliance Machine Castings Co., Alliance, Ohio. The erection of an addition to the present plant has been authorized by the directors. It will mean the employment of 100 more men when completed.

Shipbuilding at the Chester, Pa., plant of the Merchant Shipbuilding Corporation has ceased and in the future all work in both shipbuilding and steel fabricating will be done at the William Cramp & Sons Co., Philadelphia. Both concerns are Harriman interests.

The Independent Pneumatic Tool Co., 600 W. Jackson Boulevard, Chicago, announces the appointment of Blake C. Hooper, of Minnesota Supply Co., Pioneer Building, St. Paul, Minn., as special railroad agent, in the Northwest for the sale of Thor Tools.

Announcement is made by the Newton Steel Co., that four of the company's eight new mills at Newton Falls, Ohio, will be completed and placed in operation in January. A strong demand for automobile sheets is reported.

Brier Hill Steel Co. officials, Youngstown, Ohio, announce that the Tod Blast furnace of the company will suspend operations soon.

Work on the erection of a 500 ton blast furnace for the Sharpsville Furnace Co., Sharpsville, Pa., has been started, it is announced. The furnace is expected to be completed in four months.

Resignation of Frank G. Walker as superintendent of the Bessemer department of the Republic Iron and Steel Co., Youngstown, Ohio, was announced recently. It became effective January 15 when Joseph Welsh becomes superintendent. Walker is to be superintendent of the new plant of the Youngstown Steel Co., at Warren.

The Connecticut Valley Manufacturing Co., Centerbrook, Conn., bits, tools, etc., has recently announced an increase in its capital stock from $60,000 to $150,000.

The Eastern Machine Screw Co., machine screws products, etc., New Haven, Conn., has increased its capitalization from $500,000 to $1,000,000, and has filed a certificate to that effect in the office of the Secretary of the State of Connecticut, during the current week.

The Oxweld Acetylene Co. announces that its Western Dept., formerly located at 1077 Mission St., San Francisco, has been moved to larger quarters in the same block. The new address is 1050 Mission St.

The Beaton & Cadwell Manufacturing Co., air valves, etc., New Britain, Conn., recently increased its capital stock from $100,000 to $200,000.

P. S. Olmstead and E. G. Olmstead, New Philadelphia, Ohio, have acquired the controlling interest in the Sharp Manufacturing and Supply Co. The new owners assume control of the plant at once. Earl Olmstead has for the past 18 years been identified with the company.

Would Amend, Not Abolish Immigration Laws

Hearings before the House committee on immigration, looking toward amendment of the present 3 per cent quota immigration law rather than framing of permanent immigration legislation, have made clear that representative industries are not seeking a lowering of the bars to admit a flood of aliens, but rather what they consider would be improvements upon the present system with restrictions as to numbers tempered to meet conditions along elastic lines.

It is evident from the expressions of members of the committee that witnesses who have appeared before that body have made a favorable impression although there is nothing to indicate how far the members of the committee will be willing to go toward indorsing the views which have been expressed.

Hoover Refuses Interior Portfolio

It is known that Commerce Secretary Hoover declined with regret the portfolio of the Interior. The Secretary of the Interior directs the work of more engineers than does any executive, public or private, of any other single agency in the world. This naturally appeals to Mr. Hoover, who is an engineer. It is believed that Secretary Hoover was influenced by the fact that a change would prevent his seeing to a satisfactory conclusion the launching of the work he has initiated, or reorganized, in the Department of Commerce. Two years of the term have expired. By concentrating his efforts on the work in the Department of Commerce, Mr. Hoover evidently hopes to be able to round out his plans satisfactorily. Were he to change to the Department of the Interior, the remainder of the term does not give sufficient time to carry through any comprehensive program, so that his opportunity to be useful in the new post would be materially limited. It is a rather notable honor, however, to have been tendered two Cabinet portfolios within two years.

Plan World Congress of Engineers

Committees Appointed to Perfect Details for International Meeting in Philadelphia at the Time of the Sesqui-Centennial

A Conference on Plan and Scope for an International Engineering Congress to be held at the time of the Sesqui-centennial Celebration in Philadelphia was held under the auspices of the Committee on Plan and Scope in New York City, Tuesday, January 9. The meeting was called to order by Richard L. Humphrey, Chairman, who outlined the purposes of the conference and reviewed briefly the events leading to the calling of the meeting.

The movement to hold a World Congress of Engineers in 1926 at the time of the Sesqui-centennial Celebration in the City of Philadelphia was initiated by the Engineers Club of Philadelphia in December, 1921, and an invitation at that time was extended to the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Society for Testing Materials. Each was requested to appoint two representatives to meet with a committee of the Engineers Club in Philadelphia to formulate a plan for such a World Congress.

Mr. Humphrey read the various resolutions and summarized the work that had been done in forwarding this plan up to the present time. An outline of the plan of organization for such a Congress was prepared by the Secretaries of the four Founder Societies in May, 1922, and was subsequently approved by the Presidents of those Societies. This plan in general proposed a board of management, which was duly carried out in an organization meeting in November, 1922. The following men were appointed representing the different participating organizations:

American Society of Civil Engineers, George S. Webster and Richard L. Humphrey; American Institute of Mining and Metallurgical Engineers, J. Vipond Davies and Charles F. Rand; American Society of Mechanical Engineers, James Hartness and D. Robert Yarnall; American Institute of Electrical Engineers, Arthur E. Kennelly and Charles E. Skinner; Federated American Engineering Societies, J. Parke Channing and L. P. Alford; The Engineers' Club of Philadelphia, W. C. L. Eglin and Charles E. Billin.

The board of management later organized and elected George S. Webster temporary chairman and Charles E. Billin, temporary secretary, and appointed the following committees:

Nominating committee, J. Vipond Davies, Chairman, L. P. Alford and Richard L. Humphrey; Committee on Plan and Scope, Richard L. Humphrey, Chairman, Charles F. Rand, James Hartness, Arthur E. Kennelly, J. Parke Channing and W. C. L. Eglin; Committtee on Participation, E. Robert Yarnall, Charles E. Skinner and Charles E. Billin.

In carrying out the purposes of the proposed Congress, the conference on January 9, was called to order by the Committee on Plan and Scope, and discussion took place under the following four general headings:

Scope of the Congress, Finance, Relation of meetings of engineering societies to the sessions of such a Congress, and Publicity.

Some twenty-five or thirty leading engineers from the different engineering organizations, including the American Society of Civil Engineers, the American Institute of Mining and Metallurgical Engineers, the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the Federated American Engineering Societies, expressed their ideas on all these topics. It was brought out in the discussion that this meeting represented another step toward bringing the engineers of the different countries of the world closer together, taking up the threads of contact that had been broken by the war and fostering a better understanding of the relation of the engineer not only to the technical problems of the world, but to the reconstruction of our present day civilization, to which the engineer has already contributed so much in a material way.

There was a general agreement that a world congress of engineers would constitute an epoch-making step in bringing the engineers of the world together, providing a program were developed that would emphasize the broader relations of the engineer to the public, rather than the development of a large number of technical papers.

It was stated by several present that the opportunity exists particularly to make engineers abroad acquainted with the actual engineering achievements and accomplishments in this country, to work out in connection with such a Congress a tour of the different industrial cities, and, in general give visitors an opportunity to see our engineering expressed in works, as well as in words.

Those contributing especially to the discussion were: A. M. Hunt, H. Foster Bain, Henry A. Lardner, Fred Lavis, A. R. Ledoux, John W. Lieb, Elmer A. Sperry, Mortimer E. Cooley, Charles F. Rand, F. M. Feiker, C. O. Mailloux and Clayton H. Sharp.

Indiana Seeks to Prevent Strikes by Law

The trade is considerably interested in a bill to be presented at the next session of the Indiana general assembly, which, in the belief of its framers, would prohibit strikes in all forms in Indiana. The bill is the first of its kind that ever has been presented to an Indiana legislature and even those most enthusiastic in its favor admit that such a bill will have a difficult time getting enacted into law. It will be fought vigorously by organized labor.

The draft is said to have been shown to a number of members of the next legislature and is said to have been discussed with a number of prominent Hoosiers interested in such legislation. The exact identity of the forces behind the measure is being kept a close secret.

The proposed bill is entitled "an act to protect a person in his right to work for the support of himself or family, and providing penalties for violation thereof." It is to be known as a "right to work" bill, but its general effect, those behind the movement assert, will be to forestall the organization or calling of industrial walkouts.

No Unemployment Problem Says Secretary Hoover

There is no conflict between recent statements made by Commerce Secretary Hoover and Labor Secretary Davis as to unemployment. Secretary Hoover explains that he did not say that there is no unemployment. He did say that there is no unemployment problem. Secretary Davis at about the same time declared that there are 1,500,000 wage earners in the country who are "not attached to any payroll."

At Secretary Davis' office it is explained that this figure represents the normal unemployment. It is the irreducible minimum, he believes. There always is a floating pool of unemployed, due to the seasonal character of many industries and the fact that shifts from one type of employment to the other do not coincide precisely.

Control of C. & O. Gained By Van Sweringens

Formal application was made by O. P. Van Sweringen and M. J. Van Sweringen of Cleveland to the Interstate Commerce Commission at Washington requesting permission to hold offices in the Chesapeake and Ohio Railroad if and when elected. The Van Sweringens at the present time control the Nickel Plate, Clover Leaf, Lake Erie & Western and subsidiary companies and have recently acquired the Huntington interests in the Chesapeake and Ohio Railroad.

The Chespeake and Ohio Company own the Hocking Valley, the Bridge Co., at Cincinnati used to hold terminal property, and the Chesapeake and Ohio Co., of Indiana.

Important Work Done By Standards Bureau

Since a considerable period is likely to elapse before a director will be chosen for the U. S. Bureau of Standards, importance is attached to the designation by Secretary Hoover of Dr. Fay C. Brown as the acting director, who will direct the work of this important sub-division of the Department of Commerce during the interim.

While Dr. Brown regards as his principal achievement the work that he has done in directing the Bureau, which Secretary Hoover likes to refer to as "the largest physical laboratory in the world," he has done a great deal of research in addition to his administrative duties. He is proud of his work in thermionics, since that proved to be a sort of forerunner of radio amplification. He did important optical work and has made an intensive study of the electrical and mechanical properties of selenium and selenium crystals. With Joel Stebbins, the astronomer, he took an important part in starting the work on the mechanical measurement of the intensity of double stars.

Obituary

WILLIAM M. CRAMP, aged 91 years, died at his home in Philadelphia, January 8. Mr. Cramp was the son of the founder of the William Cramp and Sons Ship and Engine Co. He retired from active business about twenty years ago and since that time has been active only in fraternal affairs. He was the oldest living member of the Union League at the time of his death.

GEORGE L. GERWIG, aged 62 years, prominent in Youngstown, Ohio, steel manufacturing circles, died recently in Tucson, Ariz. He first became identified with the Old Brown-Bonnell mill, retaining his position when that plant became part of the Republic Iron and Steel Co. He was connected with that firm in an official capacity at the time of his illness. His wife and several children survive.

WILLIAM A. HARTLEY, seventy-one years old, a retired manufacturer of Muncie, Ind., died recently at his home. He was a member of the J. H. Smith Bending Works Co., for many years and when it was absorbed by the Pioneer Pole Shaft Co., he became buyer for the company. He was a member of the clay board of safety in Muncie some years ago. He is survived by his widow, his son and two daughters.

CHARLES HENRY COLBY, aged 90 years, died January 3, at his home, East Orange, N. J. Mr. Colby was an inventor, manufacturer and merchant. He was well known as the inventor of a saw-cutting and polishing machine and a multiple button hole machine. At one time in his career he was engaged in the tool business.

ALBERT M. GAINES, aged 48 years, died recently at his home in Saco, Me. Mr. Gaines was a mechanical engineer with the York Manufacturing Co. Death was due to pneumonia. He is survived by his wife, his father, his brother and his sister.

MAXWELL H. RUPPE of the Transportation and Equipment Co., is dead at his home in Youngstown, Ohio. He came to Youngstown three years ago after working for the Independent Motors Co., for some time.

Personals

J. S. ROSE and H. R. SPANDEL have been appointed managers of the New York office of the Anglo-American Industrial Diamond Co., Inc., with headquarters at 14 West 40th St.

JUDGE LEONARD J. NICKERSON, director of the Bantam Ball Bearing Co., ball bearings, etc., of Bantam, Conn., has been nominated for speaker of the House of Representatives at the State Capitol, Hartford, Conn.

ROBERT DARLING, of the Standard Screw Co., screw products, Hartford, Conn., has been elected a director of the First National Bank of Hartford, at the annual meeting of the bank held this week.

JARVIS WILLIAMS, JR., general manager of the Remington Arms-Union Metallic Cartridge Co., Bridgeport, Conn., ammunition, cutlery, etc., has recently been honored by his election as a member of the board of directors of the Bridgeport Trust Co., one of Connecticut's largest banking institutions.

JOHN K. BOLL, for several years sales manager of the Page Steel and Wire Co., Pittsburgh, Pa., has resigned to become affiliated with the Wheeling Steel Products Co., Wheeling, W. Va., in a sales capacity. The company will sell the output of the new rod and wire mills of the Whittaker-Glessner Co., now near completion at Portsmouth, Ohio.

J. M. HILL, Canton, Ohio, has been named general manager of the new plant of the Weirton Sheet Steel Co., Weirton, W. Va. He formerly was identified with the Seneca Iron and Steel Co., Buffalo, N. Y., and for several years was with the Canton Sheet Steel Co., Canton, Ohio. He also has had connections in recent years with the Reeves Manufacturing Co., Dover, Ohio, and with the Appolo Steel Co., Appolo, Pa.

HARRY C. EHRICK, superintendent of the Mansfield plant of the Hadfield-Penfield Steel Co., has returned to Bucyrus, Ohio, to take over the duties of general superintendent of the Bucyrus shops of the company, succeeding O. L. Bradley, resigned. William Ehrick has been promoted superintendent of the Mansfield plant of the company. O. L. Bradley goes to Galion, Ohio, to become shop manager for the Galion Iron Works and Manufacturing Co.

H. D. Jones, who was with the Galion Iron Works until recently, is now in charge of operations at the Carroll shops, Bucyrus, Ohio.

Export Opportunities

The Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., has inquiries for the agencies of machinery and machine tools. Any information desired regarding these opportunities can be secured from the above address by referring to the number following each item.

Hardware, tool and spring steel, mild steel and basic steel plates, metal sheets, brass and copper rods and tubes, boiler fittings, machinery and tools, cotton mill and railway stores, electrical apparatus, provisions, glassware and crockery, cutlery, galvanized and other wires; automobiles, motor cycles, and bicycles, and their accessories—India. Purchase and agency desired. Quotations, c. i. f. port of India. Reference No. 4726.

Furnaces, machinery and any other modern apparatus for the making of glass, especially the manufacture of all styles of bottles—Chile. Catalogs, in Spanish, and prices are desired. Reference No. 4758.

Knitting machines for the manufacture of hosiery. Italy. Both hand and motor-driven machines desired. Agency. Correspondence, French or Italian. Reference No. 4970.

Machine for closing (sewing) sacks filled with flour and bran. Mexico. Purchase. Quotations f.o.b. New York or New Orleans. Terms: cash with orders. Catalogs and price lists desired. Reference No. 4071.

Machine tools. Norway. Purchase and agency. Quotations, c.i.f. Norwegian ports. Payment arranged through banks in Norway and New York. Rerence No. 4972.

Engine to crack 100 tons of babassu nuts per day, boiler and pumps for same, etc.; machinery for separating kernels of curua, tecum, and babassu nuts; machinery for extracting oil from these nuts; machinery for making barrels. Brazil. Purchase. Quotations c.i.f. Brazilian ports. Correspondence, Portuguese. Catalogs are requested. Reference No. 4966.

Candy-making machinery. China. Purchase. Quotations, c.i.f. Chinese port. Catalogs and price lists requested. Reference No. 4967.

Machinery for making cereal breakfast foods from corn, rice and wheat. Uruguay. Purchase. Quotations f.o.b. New York. Terms: cash. Reference No. 4968.

Machine tools for automobile repair shop, re-forming press for iron, and foundry installations for bronze and malleable iron. Greece. Purchase. Quotations, c.i.f. Greek port. Terms: payment arranged by confirmed letter of credit against documents. Correspondence, French. Reference No. 4969.

Coal cutter machinery. South Africa. Agency. Reference No. 4927.

Machinery for the manufacture of rope, cordage and string from maguey and other fibers. Guatemala. Purchase. Quotations, c.i.f. Guatemala ports. Terms, cash against documents. Correspondence, Spanish. Reference No. 4931.

Woodworking and metal-working machinery. Czecho-Slovakia. Agency. Reference No. 4951.

Standardized automobile parts, such as motors, wheels, radiators, gears, brakes, steering gears frames and transmissions. Norway. Purchase. Reference No. 4956.

Storage batteries parts and accessories and machinery and apparatus for the manufacture of storage batteries. Cuba. Purchase. Reference No. 4961.

Machinery for the manufacture of peanut butter. Mexico. Purchase. Catalogs and prices requested. Reference No. 4964.

Forthcoming Meetings

National Automobile Chamber of Commerce, National Automobile Show, January 27 to February 3, 1923, Coliseum and First Regiment Armory, Chicago, Ill.

American Institute of Electrical Engineers, Mid-Winter Meeting, February 14 to 16, Engineering Societies Bldg., New York, F. L. Hutchinson, Secretary.

American Society for Steel Treating, Winter Sectional Meeting, City Club, Chicago, Ill., February 8 and 9, 1923. National Secretary, W. H. Eisenman, 4600 Prospect Ave., Cleveland, Ohio.

Universal Patent Exposition, First Annual Convention and exhibit of patents and inventions, Grand Central Palace, New York City, February 17 to 22, 1923. A. B. Cole, 110 West 40th St., New York City, is chairman.

American Institute of Mining and Metallurgical Engineers, Annual Meeting, February 19 to 21. Engineering Societies' Bldg., New York. F. S. Shartless, Secretary.

Society of Industrial Engineers, Spring convention at Hotel Gibson, Cincinnati, Ohio, April 18 to 20. Secretary, George C. Dent, 327 South La Salle St., Chicago, Ill.

National Foreign Trade Council, Annual meeting at the Grunewald Hotel, New Orleans, La., April 25 to 27, 1923. O K. Davis, Secretary, 1 Hanover Square, New York City.

American Foundrymen's Association, Annual convention, and exhibition at Public Hall, Cleveland, Ohio, April 30 to May 3, 1923. C. E. Hoyt, 140 South Dearborn St., Chicago, is secretary.

American Electro Chemical Society, Semi-annual meeting, Hotel Commodore, New York City, May 3 to 5, 1923. Colin G. Fink, 327 South La Salle St., Chicago, Ill., is secretary.

National Supply and Machinery Dealers' Association; Southern Supply and Machinery Dealers' Association; and the American Supply and Machinery Manufacturers' Association, triple convention, in Cincinnati, Ohio, May 17, 18, 19, 1923. F. D. Mitchell, 1819 Broadway, New York City, is secretary.

American Society for Testing Materials, Annual meeting at Atlantic City, June, 1923. C. L. Warwick, 1315 Spruce St., Philadelphia, is secretary.

New and Enlarged Shops

Machine Tools Wanted

Conn., Hartford—A. D. Brochu, 258 Windsor Ave.—machine shop equipment.

Ill., Chicago—Illinois Central R.R., Central Sta., 135 East 11th Pl., J. J. Bennett, Purch. Agt.—$45,000 worth of machinery for shops at Centralia.

Ill., Elgin—Kirk, P. O. Box 212—one Detroit centerless grinder.

Ind., Indianapolis — H. E. Dorsey, 735 Massachusetts Ave.—sheet metal working machinery and equipment.

Kan., Leavenworth—C. W. Parker, South 4th St. (machine shop)—36 in. spot welder with a 2¼ in. plate capacity.

Mass., Boston—M. P. Brundige Co., 147 Pearl St., (millwright)—additional equipment for machine shop and foundry at 137 Welles Ave. and 21 Barnes St.

Mass., Boston—J. E. Cain, 17 Fulton St., (dealer in butter, cheese and eggs)—tools and equipment for garage, at 45 B St.

Mass., Boston—W. J. Flaherty, 72 Broad St., (machine shop)—two power presses, about 12 x 18 in., Chandler & Price preferred (used).

Mich., Detroit—Harringer Fdry. & Mfg. Co., 1011 Rivard St.—two small engine lathes, one polishing lathe, one drill press and one vise.

Mich., River Rouge—Whitehead & Kales Co., South Dearborn St., (structural steel)—large press similar to No. 60 Toledo.

Minn., Minneapolis—Cowin & Co., Inc., 526 McKnight Bldg., (reinforcing steel and rolled threads)—drill press, forge and anvil (used).

Mo., St. Louis — William Koch Boiler Wks., 406 North Main St., W. Koch, Pres.—square pin shears, 30 in., 20 gauge.

Mo., St. Louis—United States Motor Bus Transportation Co., 911 Title Guaranty Bldg.—machinery for 3 proposed garages, for housing, repairing and equipping motor buses.

N. Y., Binghamton—McManus & Buckley, P. Trust Co.—equipment for proposed garage.

N. Y., Buffalo—A. Dicianni, 417 Niagara St.—equipment for repair shop and light manufacturing.

N. Y., Harrisville—Pahud Lumber Co., Inc., (garage, machine shop and lumber), H. J. Corbitt, Benson Mines, Purch. Agt.—woodworking tools including lathe, drill press and miscellaneous equipment for machine repair shop.

N. Y., Watertown—R. E. Parker Co., 144 Mechanic St., (machine shop)—one 18 in. B geared engine lathe (new or used).

N. Y., Watertown—Watertown Garage Co., 252 State St., A. T. Matthews, Purch. Agt.—complete machine tool equipment for garage and repair shop.

N. C., Charlotte—Southern Spindle & Flyer Co., 805 West 1st St., (manufacturer of cotton mill machinery)—machine shop equipment.

O., Cleveland—Pioneer Alloy Products Co., 16601 Euclid Ave.—two plain 12 in. turret lathes, Warner and Swasey or Bardons and Oliver.

O., Massillon—Bd. Educ., E. P. McConaughy, Pres.—lathes, planers, drill presses, band saws and miscellaneous shop equipment for new Washington High School.

Pa., Phila.—Amer. Pulley Co., 4200 Wissahickon St.—additional equipment for machine shop in new factory.

Pa., Phila.—S. Yellin, 5520 Arch St.—additional metal working equipment for new shop.

Pa., Titusville—A. W. Caflish, c/o Caflish Lumber Co.—machinery, tools and equipment for proposed $40,000 garage on Central Ave.

Tex., Waco—Perfection Ice Scoring Machine Co., R. H. Roark, Pres.—machine suitable for cutting straight or helical teeth in steel gears as follows: 4 in. P. D. 6 pitch, 24 tooth, 1⅛ face, mitre gears; 3 in. P. D. 6 pitch, 18 tooth, 1¼ in. face, bevel gears; 6 in. P. D. 6 pitch, 36 tooth, 1¾ in. face, bevel gears; 6¼ in. P. D. 3 pitch, 19 tooth, 1¾ in. face, mitre gears (rebuilt preferred).

Va., City Point—Wilson-Hock Co., (machinery), N. Wilson, Mgr.—18 in. selective head lathe, length of bed about 14 ft., swing over shears 20½ in., swing over carriage 12½ in., one 16 in. and one 12 in. check, complete with dies, tools, etc.; 4 to 12 in. or 4 to 10 in. pipe machine with regular equipment and extra set of dies and nipple holder; 4 ft. high duty radial drill press with gear for drive and plain box table; 25 in. sliding head upright drill press; 16 in. double emery grinder with guards; combination pipe and bolt cutting machine with drill for ½ to 1¼ in.; 24 in. heavy duty crank shaper; 12 in. B & S gate valve; 12 in. B & S base ell; two 18 x 36 simple Corliss engines; five cotton dryers; 40 to 45 ft. high tower with steel tank of 20,000 gal. capacity; 9 to 12 ton capacity 36 in. gauge steam locomotive.

Wis., Juneau—E. T. Klug—drill press, lathe and grinders.

Wis., Oshkosh—Gibson Auto Exchange, 720 Church St., A. Gibson, Mgr.—additional repair machinery for proposed garage at Appleton.

Wis., Wausau—Hammer Blow Tool Co., c/o T. H. Jacob, 219 Sturgeon Eddy Rd.—machinery and tools for the manufacture of special machinery.

Ont., Durdas—R. Knowles—equipment for garage and automobile repair shop.

Ont., Toronto—Maloney Electric Co. of Canada, Ltd., York Bldg.—machinery, including shearing machines, drills, lathes, punchers, also winding and lacquering equipment for the manufacture of electric transformers.

Ont., Toronto—Toronto Transportation Comn., 35 Yonge St., H. H. Couzens, Genl. Mgr.—complete machine shop and car repair shop equipment, including cranes, lathes, drills and planers (electric power).

Cuba, Jatibonico—Ingenio Jatibonico, P. L. Clarke, Ch. Engr.—catalogs and prices of machine tools, including lathes, planers, shapers, milling machines, drill presses and small hydraulic presses.

Machinery Wanted

Ala., Decatur — **Bd. Educ.** — vocational equipment.

Calif., Anaheim — Anaheim Valencia Growers' Association—$7,500 worth of equipment for proposed citrus packing plant.

Calif., Los Angeles—Minarock Products Co., 836 Ducommon St.—rock crusher, screens, etc., for proposed plant.

Calif., Red Bluff—G. G. Stice, mayor, and M. O. Ballard, sheriff—equipment for fruit and vegetable evaporating plant.

Conn., New Haven — The New Haven Dairy Co., 201 Hazel St.—equipment, etc., for proposed ice cream plant at Bridgeport.

Fla., Bradentown—Bradentown Novelty Co., A. Wadsworth, Mgr.—hollow mortiser and two-drum sander.

Idaho, Coeur D'Alene—Mitchell Boat Co., P. Mitchell, Pres.—complete machinery and equipment for proposed boat factory.

Idaho, Lewiston—Prairie Land Co.—machinery for proposed flour mill and elevator.

Idaho, Weippe—Lola Lumber Co.—equipment for proposed sawmill.

Ill., Aurora—Aurora Wet Wash Laundry Co., 283 Pierce St.—one large size mangler.

Ill., Chicago—J. P. Leonard, 24 South Quincy St., (job printer)—cylinder press and numbering machine.

Ill., Herrin—J. Zum, 920 South 13th St.—complete newspaper equipment.

Ill., Rochelle—Carron Spinning Mills—two 64 to 80 spindle, 8 x 4 cone rovers; one 100 to 160, 6 in. traverse, 2¾ in. ring.

Ill., St. Francisville—The Times Printery—30 in. power paper cutter.

Ill., Waukegan—T. Goldsmith, 219 Belvidere St. (produce)—power refrigeration machinery.

Ind., English—Rice Box & Basket Co.—machinery and equipment for factory, to replace that which was destroyed by fire.

Ind., Montpelier — Herald — 7 column quarto 2 revolution press.

Ind., South Bend—C. O. Molz—complete newspaper equipment (used preferred).

Ia., Sioux City — Western Newspaper Union, 5th and Virginia Sts.—8 x 12 in. power job printing press.

Kan., Colony—Free Press—6 column quarto press or 2 page, 7 column press.

Kan., Fredonia—Wilson County Citizen—linotype.

Ky., Ashland—Rice-Emrick Lumber Co.—machinery and equipment for planing and finishing mill.

Ky., Prospect—G. Heheman—electrical and mechanical local mining and conveying machinery.

La., New Orleans—Ben-Hopper Machine Wks., 601 Bourbon St., (tool and die makers), E. C. Hooper, Mgr.—one pressure die casting machine (new or used).

Me., Dexter—J. L. Hadie—machinery for woolen mill, at Tilton, N. H.

Md., Baltimore—Amer. Ice Co., Calvert Bldg.—ice making machinery for proposed plant on Eden St.

Md., Dunkirk—Georgia Brick Co., R. Wilson, Pres.—brick making equipment.

Mass., Boston—Boston & Maine R.R., North Sta., A. W. Munster, Purch. Agt.—equipment for locomotive repair shops at Concord, N. H.

Mass., Charlestown (Boston P. O.)—H. P. Hood & Sons, Rutherford Ave. (milk dealers), address Purchasing Agent—additional bottling machinery for various plants in Boston and vicinity.

Mass., Westwood — F. Ford, Box 10—complete line of machinery and equipment for small nickel, gold and silver plating plant (used).

Mich., Detroit—International Mchy. Co., 140 East Larned St.—one open side planer, 48 in. x 12 ft., 3 heads.

Minn., St. Paul—St. Paul Gas Light Co., 6th and Cedar Sts.—receiving bids until Jan. 22, pulverized fuel equipment, etc.

Miss., Moss Point—J. L. Dantzler—machinery for the manufacture of paper.

Mo., Jefferson City—Ramsey Supply Co. (machinery), A. Ramsey, Purch. Agt.—large stone crusher.

Mo., St. Louis—Boal Laundry Co., 4928 Natural Bridge Ave., W. E. Boal, Purch. Agt.—simplex mangle ironer.

Mo., St. Louis—Kee Lox Mfg. Co., 312 North 6th St., (manufacturer of keys)—power paper cutter.

Mo., St. Louis—Nu Way Printing & Engraving Co., 119 North Bway., C. J. Miller, Purch. Agt.—26 or 30 in. paper cutter (used).

Mo., St. Louis—Von Hoffman Press, 9th and Walnut Sts.—printing presses, linotypes and bindery machinery for proposed addition to plant.

N. J., Atlantic City—Peter Hernig's Sons Co., Inc., Connecticut and Baltic Sts.—conveyors and chutes for proposed milk depot.

N. J., New Brunswick—G. A. Bond & Co. (textiles)—three saw gin machines (used).

N. J., Phillipsburg—Standard Silk Co.—silk machinery and equipment for plant at Oxford.

N. J., Port Norris — Advertiser (newspaper)—power metal saw for sawing meta' cuts.

N. Y., Adams—Mather-Grow Co., Inc., (coal, wood, lumber, etc.), A. B. Grow, Purch. Agt.—two 2½ ton triple chain hoists.

N. Y., Batavia—Batavia Times Publishing Co., A. F. Kleps, Mgr.—additional machinery and equipment for newspaper plant.

The Weekly Price Guide

RISE AND FALL OF THE MARKET

Advances—Price of $2 per 100 lb. on soft steel bars giving way to somewhat frequent quotations of $2.10@$2.15, f.o.b. Pittsburgh. Bars showing heavy demand; mills sold through first quarter, and considerably well booked for second quarter shipments. Shapes unusually firm for this season of the year; quoted at $2 per 100 lb., f.o.b. mill. Quotations under $2, on steel plates, no longer appearing in market; mills rapidly filling up on orders, principally for car materials. Maximum on sheets, 25c. per 100 lb. higher at mill.

General advance of $2 per ton in lead market. Tin and solder up 1c. per lb. in New York; Chinese antimony also ¼c. per lb., higher. White and red lead, both dry and in oil, rose ¼c. per lb. during week, making the second advance since the first of the year.

Declines—Weak undertone to copper market. Zinc in carlots, declined 5c. per 100 lb. in New York warehouses. Linseed oil market quiet, with no changes in price.

IRON AND STEEL

PIG IRON — Per gross ton — Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$27.55
Northern Basic	28.27
Southern Ohio No. 2	29.77
NEW YORK—Tidewater Delivery	
Southern No. 2 (silicon 2.25@2.75)	33.44
BIRMINGHAM	
No. 2 Foundry	23.00
PHILADELPHIA	
Eastern Pa., No. 2x (silicon 2.25@2.75)	30.14
Virginia No. 2	32.17
Basic	26.75
Grey Forge	28.00
CHICAGO	
No. 2 Foundry local	28.50
No. 2 Foundry, Southern (silicon 2.25@2.75)	29.02
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	25.50
Basic	25.00
Bessemer	28.00

IRON MACHINERY CASTINGS—Cost in cents per lb. of 100 flywheels, 6-in. face x 24-in. dia., hub not cored, good quality gray iron, weight 275 lb.:

Detroit	6.0
Cleveland	5½@6
Cincinnati	4.5@6
New York	5.5
Chicago	4@5

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.50@2.75	4.19	3.70	4.00
No. 12	2.60@2.85	4.24	3.75	4.05
No. 14	2.70@2.95	4.29	3.80	4.10
No. 16	2.90@3.15	4.39	3.90	4.20
Black				
Nos. 17 and 21.	3.20@3.35	4.30	4.20	4.70
Nos. 22 and 24.	3.25@3.40	4.35	4.25	4.70
Nos. 25 and 26.	3.30@3.45	4.40	4.30	4.75
No. 28	3.35@3.50	4.50	4.40	4.85
Galvanized				
Nos. 10 and 11.	3.35@3.50	4.50	4.40	4.85
Nos. 12 and 14.	3.45@3.60	4.60	4.50	4.95
Nos. 17 and 21.	3.75@3.90	4.90	4.80	....
Nos. 22 and 24.	3.90@4.05	5.05	4.95	5.40
No. 26	4.05@4.20	5.20	5.10	5.55
No. 28	4.35@4.50	5.50	5.40	5.90

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	Iron Inches	Black	Galv.
		BUTT WELD			
1 to 3	66	54½	¾ to 1½	34	19
		LAP WELD			
2	59	47½	2	29	15
2½ to 6	63	51½	2½ to 4	32½	19
7 to 8	60	47½	4½ to 6	32½	19
9 to 12	59	46½	7 to 12	30	17
		BUTT WELD, EXTRA STRONG, PLAIN ENDS			
1 to 1½	64	53½	¾ to 1½	34	20
2 to 3	65	54½			
		LAP WELD, EXTRA STRONG, PLAIN ENDS			
2	57	46½	2	30	17
2½ to 4	61	50½	2½ to 4	33	21
4½ to 6	60	49½	4½ to 6	32	20
7 to 8	56	43½	7 to 8	25	13
9 to 12	50	37½	9 to 12	20	8

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	57%	44%	55½%	43½%	62½%	48½%
2½ to 6 in. steel lap welded	54%	41%	53½%	40½%	59½%	45½%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 6%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	4.50	6.00	4.50
Spring steel (light) (base)	6.00	6.00	6.00
Coppered Bessemer rods (base)	6.03	8.00	6.10
Hoop steel	4.39	3.71	3.90
Cold rolled strip steel	6.75	8.25	7.25
Floor plates	5.50	5.16	5.50
Cold finished shafting or screw	3.90	3.75	3.70
Cold finished flats, squares	4.40	4.25	4.20
Structural shapes (base)	3.14	3.01	3.02½
Soft steel bars (base)	3.04	2.91	2.92½
Soft steel bar shapes (base)	3.04	2.91	2.92½
Soft steel bands (base)	3.84	3.61	3.55
Tank plates (base)	3.14	3.01	3.02½
Bar iron (2.60 at mill)	3.04	2.91	2.92½
Drill rod (from list)	55@60%	40%	50%
Electric welding wire:			
5/32	8.50		12@13
⅛	7.00		11@12
5/32 to ¼	6.75		10@11

METALS

Current Prices in Cents Per Pound

Copper, electrolytic (up to carlots), New York	15.37½
Tin, 5-ton lots, New York	40.25
Lead (up to carlots), St. Louis 7.60@7.65; New York	8.17½
Zinc (up to carlots), St. Louis 6.95@7.00; New York	7.45

	New York	Cleveland	Chicago
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.20	24.00	23.00
Antimony (Chinese), ton spot	7.50@7.60	8.25	7.25
Copper sheets, base	23.50	22.00	23.00
Copper wire (carlots)	16.62½	18.75	16.25
Copper bars (ton lots)	20.50	22.75	19.50
Copper tubing (100-lb. lots)	25.25	25.75	23.00
Brass sheets (100-lb. lots)	19.00	21.25	18.75
Brass tubing (100-lb. lots)	23.50	24.25	20.50

Shop Materials and Supplies

METALS—Continued

	New York	Cleveland	Chicago
Brass rods (1,000-lb. lots)	17.00	19.50	15.75
Brass wire (carlots)	19.50	20.75	.....
Zinc sheets (casks)	10.25	10.25	.....
Solder (½ and ½), (caselots)	29.00	26.25	20.00
Babbitt metal (83% tin)	42.00	49.00	36.00
Babbitt metal (35% tin)	25.00	17.50	.....
Nickel (ingot and shot), Bayonne, N. J.	36.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	39.00	.....	....

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	50
Cold drawn rods, Grades "A" and "C" (base)	60
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	54
Manganese nickel hot rolled (base) rods "D"—high manganese	57

Base price of monel metal in cents per lb., f.o.b. Bayonne, N.J.:

Shot	32.00	Hot rolled machined rods (base)	48.00
Blocks	32.00	Hot rolled rods (base)	40.00
Ingots	38.00	Cold drawn rods (base)	50.00
Sheet bars	40.00	Hot rolled sheets (base)	45.00

OLD METALS--Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	12.50	12.75	12.25
Copper, heavy, and wire	12.25	12.00	11.75
Copper, light, and bottoms	10.50	10.50	11.00
Lead, heavy	5.75	5.50	6.00
Lead, tea	5.25	4.50	4.75
Brass, heavy, yellow	7.00	....	....
Brass, heavy, red	9.50	10.00	9.50
Brass, light	6.00	6.00	6.50
No. 1 yellow brass turnings	7.00	7.00	7.50
Zinc	4.50	4.00	4.25

TIN PLATES—American Charcoal Plates—Bright—Cents per lb.

		New York	Cleveland	Chicago
"AAA" Grade:				
IC,	20x28, 112 sheets	20.00	18.25	18.50
IX,	20x28, 112 sheets	23.00	21.00	20.90
"A" Grade:				
IC,	20x28, 112 sheets	17.00	16.00	17.00
IX,	20x28, 112 sheets	20.00	18.75	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.00	11.50	14.50
IC,	112 sheets	12.30	11.90	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.00	7.25
IC,	14x20	7.25	6.25	7.40

MISCELLANEOUS

	New York	Cleveland	Chicago
Cotton waste, white, per lb.	$0.11½	$0.13	$0.11½
Cotton waste, colored, per lb.	.08½	.10	.08
Wiping cloths, 13¼x13¼, per lb.	.16	32.00 per M	.10
Wiping cloths, 13¼x20½, per lb.	.20	48.00 per M	.13
Sal soda, 100 lb. lots	2.60	2.40	2.65
Roll sulphur, per 100 lb.	2.35	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.90	1.01	.98
White lead, dry or in oil	100 lb. kegs.	New York, 13.75	
Red lead dry	100 lb. kegs.	New York, 13.75	
Red lead, in oil	100 lb. kegs.	New York, 15.25	
Fire clay, per 100 lb. bag		.65	.60
Coke, prompt furnace, Connellsville	per net ton	$8.50@9.00	
Coke, prompt foundry, Connellsville	per net ton	9.00@9.50	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	40%	50-10-5%	50%
1½ and 1¼x3 in. up to 12 in.	20%	50%	50%
With cold punched sq. nuts	25%	$3.50 net	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	30%	3.50 net	$4.00 off
Button head bolts, with hex. nuts	15%	3.90 net	.....
Hex. head and hex. nut bolts	20%	.....	65-5%
Lag screws, coach screws	40%	.....	60-5%
Square and hex. head cap screws	70%	70%	70-10%
Carriage bolts, up to 1 in. x 30 in.	30%	40–10%	45%
Bolt ends, with hot pressed nuts	40%	.....	55%
Tap bolts, hex. head, list plus	20%	.....	.....
Semi-finished nuts ⅝ and larger	60%	70%	80%
Case-hardened nuts	50%	.....	.....
Washers, cast iron, ½ in., per 100 lb. (net)	$6.00	$3.50	$3.50
Washers, cast iron, ⅝ in. per 100 lb. (net)	4.50	4.00	3.50
Washers, round plate, per 100 lb. Off list	3.00	5.00	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.00	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.00	3.00	4.00
Rivets:			
Rivets, ⅞ in. dia. and smaller	45%	60%	60%
Rivets, tinned	50%	60%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$5.00	$3.90	$3.75
Cone heads, ditto (net)	5.10	4.00	3.85
1¼ to 1¾-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅝ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$3.70 base
Copper rivets	55-5%	50%	50%
Copper burs	35%	50%	20%

Lard cutting oil (50 gal. bbl.) per gal.	$0.50	$0.50	$0.67½
Machine lubricant, medium-bodied (50 gal. bbl.), per gal.	0.33	0.35	0.40
Belting—Present discounts from list in fair quantities (½ doz. rolls).			
Leather—List price, New York, per ply, 12-in. wide, per lin.ft., $2.88:			
Medium grade	30–10%	40½%	50%
Heavy grade	20–5–2½%	30–5%	40–5%
Rubber and duck:			
First grade	60%	50–10%	40–10%
Second grade	65%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.,			
No. 1 grade, per ream of 480 sheets:			
Flint paper	$5.84	$5.84	$6.48
Emery paper	8.80	11.00	8.80
Emery cloth	27.84	31.12	29.48
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll	4.50	4.28	4.95
Emery discs, 6 in. dia., No. 1 grade, per 100:			
Paper	1.32	1.24	1.40
Cloth	3.02	2 67	3.20

N. Y., Buffalo—E. E. Harris & Co., 22 Maurice St.—equipment, including one 1,500 gal. gas tank and pump, for gasoline service station on Niagara St. and West Delevan Ave.

N. Y., Buffalo—Niagara Blower Co., 486 Howard St. (metal works)—equipment for manufacturing, ventilating and dust collecting systems; also sheet steel fabrications.

N. Y., Buffalo—E. Robinson, 894 Elk St. —equipment for the manufacture of candy.

N. Y., Buffalo—K. Schantz, 78 Main St. —ice making and cold storage equipment for plant at Youngstown.

N. Y., Dansville—Power Specialty Co. (steam superheaters)—one 10 ton capacity electric bridge crane, 75 to 80 ft. span, 180 ft. runway, motor driven.

N. Y., Dexter—Dexter Sulphite Pulp & Paper Co., J. Long, Purch. Agt.—one power driven wood splitter.

N. Y., East Rochester—Merchants Despatch Transportation Co., (manufacturer of refrigerator cars). L. S. West, Genl. Mgr. —several 1,500 tons hydraulic presses, several 200 to 400 ton hydraulic presses and other steel plant equipment, including annealing furnaces, cooling beds and press machines for handling sheet steel.

N. Y., Holcomb—W. N. Clark Co.—machinery and equipment for proposed canning factory, at Batavia.

N. Y., Jamestown—General Metalsmiths, Inc., Hopkins Ave.—additional machinery and equipment for specialty plant.

N. Y., Jamestown—Jamestown Metal Desk Co., Inc., 104 Blackstone Ave.—special machinery for the manufacture of automobile window trims (steel).

N. Y., Jamestown—Jamestown, Westfield & Northwestern R.R., 560 West 3rd St., G. L. Maltby, Purch. Agt.— freight handling machinery and equipment.

N. Y., Jamestown—Red Star Lubrication Service, Inc., 114 East 4th St., D. R. Livingood, Genl. Mgr.—machinery and equipment for gasoline distributing and service station.

N. Y., Lowville—Adirondack Maple Co., (maple products), H. W. Slack, Purch. Agt.—canning machinery and equipment.

N. Y., Lowville—Fenton & Dence Inc., (lumber, sash and door, etc.)—one double surface planer and one sanding machine.

N. Y., Malone—Northern Art Stone Corp., (artificial stone, blocks and bricks), A. C. Allison, Purch. Agt.—stone crushing, screening and conveying machinery and equipment; block and brick molds, power driven.

N. Y., New York—H. Heide, 313 Greenwich St.—candy making machinery for new factory.

N. Y., New York—International Sheffield Wks., 343 West 26th St.—one drop hammer.

N. Y., Niagara Falls—Acheson Graphite Co., Buffalo Ave., (manufacturer of electrical and graphite products)—machinery and equipment for 1 story addition to plant.

N. Y., Niagara Falls—Bd. Educ.—vocational and mechanical equipment for proposed $650,000 high school.

N. Y., Norwood—Norwood Electric Light & Power Co., S. P. Phelps, Purch. Agt.— ironwork blower and equipment for built-in forge.

N. Y., Ogdensburg—Hall Coal Co.—electric crane. Estimated cost $40,000.

N. Y., Olean—Bd. Educ.—vocational equipment for proposed junior high school.

N. Y., Sacket Harbor—R. Gowing Co., Main St., (manufacturer of boats)—one 5 ton triple chain hoist and one electric portable drill, 110 v.

N. Y., Syracuse—Continental Can Co., 1016 East Water St.—machinery and equipment for addition to can factory.

N. Y., Watertown—Randall Faichney Co., State St., (manufacturer of clinical and chemical thermometers, etc.), W. F. Howe, Purch. Agt.—special machinery and equipment for the manufacture of hypodermic needles.

N. C., Charlotte—Wade Mfg. Co., South Graham St.—machinery and equipment for the manufacture of show cases, fixtures, etc.

N. C., Wilmington—Broadfoot Iron Wks., Inc., W. G. Broadfoot, Pres.—overhead traveling crane, 50 ft. 8 in. span, 3 motors using 220 volt, 3 phase, 60 cycle. 10 ton capacity.

O., Akron—Farran-Kinney Co., Mohawk Bldg., Eater St.—machinery for the manufacturer of auto fan belts.

O., Bellefontaine—Bellefontaine Printing Co.—newspaper equipment.

O., Cleveland—The city, Comr. of Purchases, City Hall—coal and ash handling machinery and equipment for treating boiler makeup water.

O., Eaton—Washington Motor Co. (manufacturer of electric motors, etc.)—machinery and equipment for addition to factory.

O., Niles—Ohio Galvanizing Co.—galvanizing machinery and equipment.

Okla., Perry—Garber Refining Co., E. A. Hutcheson, Mgr.—oil refinery machinery and equipment, including conveying equipment.

Okla., Spiro — Bd. Educ. — vocational equipment.

Pa., Centerville — Supplee, Wills, Jones Milk Co.—equipment for proposed condensery.

Pa., Coleville (Bellefonte P. O.)—B. B. Stroud Gasoline Co.—machinery and equipment for proposed refinery at Farmers Valley.

Pa., Enola—Bd. Educ., H. Hoffman, Secy. —vocational equipment for new manual training department.

Pa., Freeland—Dever Bros. Mfg. Co.—machinery for the manufacture of shoe repairing machinery.

Pa., Gibsonia—Richland Fuel Co.—A. C. shortwall coal cutting machine.

Pa., Hughesville—Buyers Mfg. Co.—woodworking machinery and equipment.

Pa., Johnstown—A. E. Kinzey, 701 Messenger St.—vocational equipment.

Pa., Kingston (Wilkes-Barre P. O.)—Bd. Educ.—vocational equipment for $200,000 to $250,000 school.

Pa., Mahoney City—Storrey-Hoppes Shirt Co.—complete machinery and equipment to replace that which was destroyed by fire.

Pa., Manayunk (Phila. P. O.) — A. T. Baker & Co., Fountain and Canal Sts., (textiles)—looms and equipment for addition to factory.

Pa., Oil City — Bd. Educ. — vocational equipment for proposed Junior High School.

Pa., Palmerton — Bd. Educ. — vocational equipment for $150,000 high school.

Pa., Phila.—Amer. Cone & Pretzel Co., 10th St. and Susquehanna Ave.—additional ovens, conveyors, dough mixers, etc.

Pa., Phila.—Art Loom Rug Mills., Allegheny Ave. and Front St.—looms, spinners, etc., for new factory.

Pa., Phila.—Albert H. Beck Co., Inc., 3935 North 7th St., (manufacturer of glass bottles), R. M. Beck, Purch. Agt.—equipment for the manufacture and packing of bottles, including saws, nailers, etc.

Pa., Phila.—Bingham Bros. Co., 521 Cherry St., (glue and paste products)—circular saw and stand.

Pa., Phila.—G. L. Bingham, 250 North Marvine St., (contractor)—double drum hoist with double cylinder steam engine.

Pa., Phila.—Calcos Steel & Iron Co., 1524 Chestnut St.—quantity of leather belting 8 in. and over.

Pa., Phila.—Crystal Silk Dye Wks., 1923 East Allegheny Ave., J. M. Laudenburgh, Purch. Agt.—dyeing vats, sticks, dryers, etc.

Pa., Phila.—Holmesburg Concrete Co., 7660 Frankford Ave., B. L. Zimmerman, Purch. Agt.—concrete block machines, forms, mixers, conveyors, etc.

Pa., Phila.—Mahtex Spinning Co., Inc., Norris and Mascher Sts., H. A. Mostelle, Purch. Agt.—looms, frames, spinning machines, etc., for new plant.

Pa., Phila. — Schadewald Mills, 3rd St. and Huntingdon Ave., N. M. Schadewald, Purch. Agt.—quantity of dye sticks and other equipment.

Pa., Phila.—Standard Steel & Bearings, Inc., 50th St. and Lancaster Ave.—one 200 lb. Bradley belt driven hammer.

Pa., Pittsburgh—Gloekler Mfg. Co., 1127 Liberty Ave., (iron, brass and wood specialties)—machinery for working iron, brass and wood.

Pa., Pittsburg—J. J. Ramsey, Ferguson Bldg.—lever shear for cutting 3 in. bars.

Pa., Scranton—Burschel Dairy Co., 9th Ave—cooling machinery and equipment.

Pa., Straustown—H. W. Anthony (textile machinery)—several knitting machines, 220 needle, 3½ in. cylinder, Banner, Wildman or Scott & Williams make.

Pa., Wilkes-Barre—Le Grand Mine Drill Wks., c/o B. F. James, 197 Barney St.—machinery for proposed plant at Edwardsville.

Pa., Wilkes-Barre—R. E. Wallace, 33 South State St.—machinery and equipment for the manufacture of automobile bodies.

Pa., Windber — Bd. Educ. — vocational equipment for $100,000 high school.

R. I., North Scituate—Adams Mfg. Co., (cotton mill)—machinery for mill at Putnam, Conn., (new).

Tenn., Knoxville—Duncan Mchy. Co., Dempster Bldg., 721 North Central Ave.—24 in. double surface planer and matcher (used); 7 in. four-sided molder (rebuilt or used); two 150 hp. horizontal return tubular boilers good for 125 to 150 lb. steam pressure, standard with full flush front, also priced with steel casings and Dutch ovens (used); 35 to 50 hp. throttling either side or center crank engine; 125 to 250 hp. Corliss engine (used).

Tenn., Memphis — Dixie Margerine Co., R. M. Stewart, Dir.—machinery for the manufacture of margerine from cocoanut oil.

Tex., Arlington — Suburban Express (newspaper)—7 column quarto 2 revolution press.

Tex., Bells—J. Jolly—newspaper press, linotype and other newspaper equipment.

Tex., Haskell — Free Press—7 quarto standard cylinder press for power equipment.

Va., Winchester—Evening Star—linotype machine (used preferred).

Wash., Spokane—White Pine Sash Co., Myrtle Ave. along tracks of Union Pacific R.R.—machinery for proposed band sawmill at Kettle Falls.

W. Va., Bluefield—Electric Baking Co.—bakery machinery.

W. Va., Follansbee—Jefferson Glass Co., A. B. McGraw, Genl. Mgr.—coal conveying machinery.

W. Va., Huntington—Enterprise Chemical Co., Box 545, F. L. Parr, Genl. Mgr.—steam and electric drills, crushing, pulverizing and screening machinery.

W. Va., Wheeling—G. M. B. Sine, c/o Wheeling Ice & Storage Co., 2224 Water St. —ice making and cold storage equipment.

W. Va., Williamson—Williamson Ice & Cold Storage Co.—machinery and equipment for 5 story ice and cold storage plant.

Wis., Delafield—C. J. Hahn—complete stone crushing machinery.

Wis., Fond du Lac—W. R. Kloeden, 377 Poplar St.—special machinery for the manufacture of twisted wire hair brushes.

Wis., Fort Atkinson—Fort Atkinson Canning Co.—canning machinery and conveyors for proposed plant.

Wis., Green Bay—Bd. Educ., I. H. McIntire, Supt. of Schools—shop equipment for manual training department of proposed high school.

Wis., Madison—Kennedy Dairy Co., 618 University Ave.—refrigerating machinery for proposed ice plant.

Wis., North Milwaukee—E. Korth, Route 5 (carpentry and millwork)—20 to 24 in. band saw and 3 in. sticker.

Wis., Oshkosh—P. Steinhilber, 151 Central St.—woodworking machinery, including lathes, planer and sander.

Wis., Racine—Progressive Dairy Co., c/o E. F. Buelow, 309 Badger Bldg.—ice making and dairy machinery.

Wis., Rubicon—Union Butter & Cheese Assn. Route No. 1, J. G. Solveson, Purch. Agt.—additional belt driven creamery machinery.

Wis., Wausau—Knowlton Canning Co., c/o A. W. Gerhard, 410 3rd St.—belt driven machinery for canning vegetables.

Wis., Wauwatosa—Western Millwork Co., 532 10th Ave., W. Dittman, Purch. Agt.—woodworking machinery, including planer and sander.

Ont., Bowmanville — Thomson Knitting Co.—knitting machines, etc.

Ont., Carleton Place—Canadian Central Weekly Newspaper Co., F. A. J. Davis, Purch. Agt.—complete newspaper and job printing equipment.

Ont., Milton—The Natl. Tractors, Ltd.—complete equipment for the manufacture of tractors, also gasoline engines.

Ont., Toronto—Chairman Toronto Transportation Comn., 35 Yonge St., receiving bids until Jan. 22, coal and ash handling equipment, including two reinforced concrete bins, track hopper, apron feeder, coal crusher, elevator conveyor, flight conveyor, ash elevator, etc., for proposed general repair shops on Bathurst and Davenport Rds.

Ont., Toronto—Whyte Packing Co., 66 Front St., E.—artificial ice plant to handle dairy and animal produce, for Mitchell. Ont. branch.

Ont., Welland—Welland Alloy Steel Co., Ltd., W. H. Devlin, Genl. Mgr.—equipment, including electric furnaces, etc., to increase capacity of plant from 30,000 to 45,000 ton.

Ont., Whitby—Canadian Wire Fence Co. —$75,000 worth of equipment for proposed factory.

Que., Donnacona—Donnacona Paper Co., Ltd., G. M. McKee, Mgr.—equipment to increase capacity of pulp and paper mill from 30,000 to 60,000 ton.

Metal Working Shops

Calif., Emeryville — The Westinghouse Electric & Mfg. Co., 1st Natl. Bank Bldg., San Francisco, is receiving bids for the construction of a 1 and 2 story first unit of plant on a 12 acre site, here. B. H. Prack, Keystone Bldg., Pittsburg, Pa., Archt. Noted Dec. 14.

Calif., Napa—F. E. Goetze, 4th and Brown Sts., plans to build a 1 story, 40 x 60 ft. addition to machine shop.

Calif., Oakland—The Foster & Kleiser Co. of California, 287 Valencia St., San Francisco, is having plans prepared for the construction of a 1 story garage and warehouse, on Market and 22nd Sts., here. Cost will exceed $50,000. Weeks & Day, Calif. Commercial Bldg., San Francisco, Archts.

Calif., Oakland—V. A. Hancock, 184 13th St., awarded the contract for the construction of a 1 story machine shop, on 23rd St. near Webster St. Estimated cost $15,000.

Calif., San Francisco—R. Simons, 728 Vallejo St., has had plans prepared for the construction of a 2 story garage and automobile salesroom on Vallejo St. near Stockton. W. Lowe, Monadnock Bldg., Archt.

Calif., San Jose—J. Whitney, c/o Wolfe & Higgins, Archts., Auzerais Bldg., is receiving bids for the construction of an automobile trimming shop and rooming house on West Santa Clara St. Estimated cost $25,000. Noted Jan. 11.

Conn., East Hartford—The Noyes-Buick Co., 17 Lawton St., Boston, Mass., plans to build a 2 story, 70 x 100 ft. automobile distributing plant and repair shop, on Orchard St., here. Estimated cost $50,000. Architect not announced.

Ill., Centralia—The Illinois Central R.R., Central Sta., 135 East 11th Pl., Chicago, will soon award the contract for the construction of a 50 x 100 ft. machinery shed. Estimated cost $90,000.

Ill., Chicago—F. J. Fadner, 941 Glengyle Pl., awarded the contract for the construction of a 2 story, 106 x 135 ft. garage at 1824-32 Juneway Terrace. Estimated cost $125,000. Noted Dec. 21.

Ind., East Chicago—W. P. Murphy, 20 West Jackson Blvd., Chicago, is having plans prepared for the construction of a 2 story, 40 x 40 ft. steel factory, here. Estimated cost $26,000. F. D. Chase, 645 North Michigan Ave., Chicago, Engr.

Ind., South Bend—The Studebaker Corp., Main and Bronson Sts., is having plans prepared for the construction of a 4 story 100 x 875 ft. addition to its automobile factory. Estimated cost $450,000. A. Kahn, Marquette Bldg., Detroit, Archt. Noted Jan. 4.

Kan., Wichita—The Hayes Equipment Co., 701 East Gilbert St., has had plans prepared for the construction of a 1 story, 79 x 232 ft. factory for the manufacture of oil tanks and pumps, on Gilbert and Santa Fe Sts. Estimated cost $20,000. E. Forsblom, 405 Sedgwick Ave., Archt.

Kan., Wichita—E. A. Watkins, c/o Watkins Mfg. Co., 1200 Riverside St., awarded the contract for the construction of a 2 story, 50 x 150 ft. factory for the manufacture of grain machines, at 204 North Waco St. Estimated cost $15,000.

Kan., Winfield — Stuber Bros. awarded the contract for the construction of a 1 story, 100 x 140 ft. garage. Estimated cost $50,000. Noted Nov. 16.

Md., Baltimore—The Air Reduction Sales Co., 342 Madison Ave., New York City, awarded the contract for the construction of a 1 story, 74 x 122 ft. valve factory, on 11th and East Fayette Sts., here. Estimated cost $70,000. Noted Dec. 14.

Mass., Ashland—The Saving Spring Co., c/o E. F. Bunker, awarded the contract for the construction of a 1 and 2 story, 50 x 150 ft. factory, for the manufacture of springs, on Pleasant St. Estimated cost $40,000.

Mass., Pittsfield—H. N. Wilson, Archt., 651 North St., is receiving bids for the construction of a 1 story, 60 x 110 ft. garage for W. K. George, 108 West Housatonic St. Estimated cost $55,000.

Mass., Springfield—O. Jurist, Hebron St., is having plans prepared for the construction of a 1 story, 112 x 133 ft. garage on Main and Marble Sts. Estimated cost $58,000. J. W. Foster, 46 Narragansett St., Archt.

Mass., Springfield—The Edward Radding Constr. Co., 377 Main St., is having plans prepared for the construction of a 1 story, 80 x 200 ft. garage and service station on State St. Estimated cost $68,000. J. W. Foster, 46 Narragansett St., Archt. Mack Motor Truck Co., 340 Chestnut St., lessee.

Minn., St. Paul—The Ford Motor Co., Highland Park, Mich., is having preliminary sketches made for the construction of a manufacturing plant on St. Catherine and Cleveland Aves., here. Estimated cost $10,000,000. A. H. Stem, 601 Endicott Bldg., St. Paul, Archt.

Mo., Hannibal—The Hannibal Garage & Machine Co. is having plans prepared for the construction of a 2 story, 65 x 142 ft. garage and machine shop, at 113 East 3rd St. Estimated cost $65,000. Burgher & Burgher, 308 Hannibal Trust Bldg., Archts.

Mo., St. Louis—The United States Motor Bus Transportation Co., 911 Title Guaranty Bldg., will soon receive bids for the construction of three 125 to 150 x 200 ft. garages. Estimated cost $300,000. McKelvey Constr. Co., 911 Title Guaranty Bldg., Engrs.

N. H., Concord—The Boston & Maine R.R., North Sta., Boston, awarded the contract for the construction of a 1 story, 162 x 170 ft. locomotive repair shops at its freight yards, here. Estimated cost $250,000. Noted Jan. 4.

N. J., Belleville—The Westinghouse Lamp Co., 60 India St., Boston, Mass., is having plans prepared for the construction of a lamp base manufacturing plant, here. Estimated cost $750,000. Stone & Webster, Inc., 147 Milk St., Boston, Mass., Archts. and Engrs.

N. Y., Binghamton—McManus & Buckley, P. Trust Co., awarded the contract for the construction of a 1 story, 104 x 204 ft. garage on Henry St.

N. Y., Jamestown—The Jamestown Metal Desk Co., 104 Blackstone Ave., awarded the contract for the construction of an addition to its factory. Estimated cost $40,000. Noted Dec. 28.

N. Y., New York—The Studebaker Corp. of America, Main and Bronson Sts., South Bend, Ind., is having plans prepared for the construction of a 6 story, 175 x 200 ft. sales and service building, on West 131st St., here. Estimated cost $400,000. W. S. Ferguson Co., 1900 Euclid Ave., Cleveland, O., Engrs. and Archts.

O., Cleveland—The Cox Brass & Mfg. Co., 5601 Carnegie Ave., awarded the contract for the construction of a 1 story, 60 x 200 ft. warehouse and machine shop on East 55th St. and Luther Ave. Estimated cost $50,000.

O., Dayton—The Duro Pump & Mfg. Co., 537 East Monument St., is having plans prepared for the construction of a 5 story factory for the manufacture of pumps and machinery. Estimated cost $175,000. Private plans.

O., Lima—The Lima Overland Co, manufacturer of automobiles, plans to rebuild its plant which was destroyed by fire. Estimated cost $35,000. Architect not announced.

Pa., Ardmore—C. Norton, Archt., is receiving bids for the construction of a 2 story, 60 x 150 ft. garage on Lancaster Ave. for Harris, LeRoy & Clarke. Estimated cost $60,000.

Pa., Bakerton (Elmora P. O.)—The Sterling Coal Co. having plans prepared for a machine shop, including motor barn and blacksmith department. Estimated cost $100,000. W. Lamont, Genl. Supt.

Pa., Eddystone—The Baldwin Locomotive Wks., 500 North Broad St., Phila., is having plans prepared for the construction of 1 and 2 story engine foundries, machine shops, etc., here. Estimated cost $3,000,000. Private plans.

Pa., Edwardsville (Kingston P. O.)—The Le Grand Mine Drill Wks., c/o B. F. James, 197 Barney St., Wilkes-Barre, plans to build a 1 story, 50 x 200 ft. drill works plant, here. Estimated cost $35,000. Architect not announced.

Pa., Erie—The Gloekler Mfg. Co., 1127 Liberty Ave., Pittsburgh, manufacturer of iron, brass and wood specialties, awarded the contract for the construction of a 1 story, 60 x 300 ft. factory on East 12th St., here. Estimated cost $60,000.

Pa., Erie—M. Griswold, 12th and Raspberry Sts., awarded the contract for the construction of a 2 story, 100 x 150 ft. garage and sales room on 20th and State Sts. Estimated cost $40,000. Noted Dec. 28.

Pa., Erie—The Henry Mayer Estate, Commerce Bldg., awarded the contract for the construction of a 2 story, 50 x 110 ft. garage and sales room at 1411-13 State St. Estimated cost $40,000.

Pa., Erie — The Odin Stove Mfg. Co. awarded the contract for the construction of a 2 story, 40 x 160 ft. addition to its factory. Estimated cost $25,000.

Pa., Phila.—S. Yellin, 5520 Arch St., awarded the contract for the construction of a 2 story, 49 x 96 ft. sheet metal works on Arch and Allison Sts. Estimated cost $30,000.

Pa., Pittsburgh—The Gulbert Eng. Co., 703 Diamond Bank Bldg., awarded the contract for the construction of a 1 story, 50 x 200 ft. steel fabricating plant on Wind Gap Rd. Estimated cost $100,000

Pa., Reading — Ballinger & Co., Archts., 12th and Chestnut Sts., Phila., are receiving bids for the construction of a 7 story, 80 x 250 ft. factory, foundry and machine shop for the Reading Hardware Co., foot of 6th St., here. Estimated cost $250,000.

Pa., Titusville—A. W. Catlish, c/o Catlish Lumber Co., plans to build a garage and service station on Central Ave. Cost will exceed $40,000. Architect not announced.

R. I., Providence—G. Wolf, Archt., 88 Althea St., is receiving bids for the construction of a 1 story garage and service station, 100 car capacity, on Library Court, for Goldberger & Steiner, Olneyville Sq. Estimated cost $40,000. Noted Nov. 16.

Tenn., Chattanooga—The Western Union Telegraph Co., 195 East Bway, New York City, awarded the contract for the construction of a 1 story, 200 x 300 ft. repair shop, here. Estimated cost $175,000.

Tenn., Nashville—The Nashville, Chattanooga & St. Louis Ry., 1000 Broad St., is building a 1 story addition to repair shops. Estimated cost $10,000.

W. Va., Parkersburg — The Blackwood Electric Steel Corp. awarded the contract for the construction of a 1 story, 140 x 230 ft. factory. Noted Dec. 7.

Wis., Appleton—The Gibson Auto Exchange, 720 Church St., Oshkosh, will build a 1 story, 46 x 82 ft. garage on College St., here. Estimated cost $50,000. A. Gibson, Mgr.

Wis., Chippewa Falls—The Chippewa Pump Co. plans to build a 2 story factory unit for the manufacture of pumps, etc. Estimated cost $50,000. Architect not selected.

Wis., Milwaukee—R. E. Oberst, Archt., 317 Grand Ave., is receiving bids and will open same about Jan. 15 for the construction of a 1 story, 64 x 100 ft. garage on 16th St. and Fond du Lac Ave. for C. W. Valencourt, 172 12th St. Estimated cost $45,000. Noted Jan. 4.

Wis., Waupun—The J. S. Morris Co., manufacturer of automobiles and carriages, plans to rebuild its 2 story factory, which was destroyed by fire. Estimated cost $40,000. Architect not selected.

Ont., Toronto—The Toronto Transportation Comn., 35 Yonge St., will soon award the contract for the construction of a 1 story car repair shop and a 2 story storage building. Estimated cost $1,500,000. H. H. Couzens, Genl. Mgr. Private plans.

Ont., Welland—The Welland Alloy Steel Co., Ltd., plans to build a steel and rolling mill for the manufacture of alloyed and carbon steel ingots, billets, rounds, squares, bars, shapes and high grade electric castings. Estimated cost $340,000. Private plans.

Ont., Whitby—The Canadian Wire Fence Co. plans to build factory. Estimated cost $25,000.

General Manufacturing

Calif., Anaheim—The Anaheim Valencia Growers' Association is having plans prepared for the construction of a citrus packing plant. Estimated cost $30,000. F. Benchley, Fullerton, Archt.

Calif., Berkeley—B. G. Wetzel, 1633 Josephine St., awarded the contract for the construction of a 1 story printing shop on Center St. Estimated cost $6,850.

Calif., Los Angeles—L. J. Coburn, c/o Hamm & Grant, Archts., Ferguson Bldg., is having preliminary plans prepared for the construction of a woolen mill and office building.

Calif., Los Angeles—The Minarock Products Co., 836 Ducommon St. will build a 74 x 230 ft. rock crushing plant.

Calif., Oakland—A. P. and G. Hoffschneider, 459 21st St., plans to build a 6 story store building and electrotype and sterotyping plant on 13th St. between Webster and Harrison Sts. Estimated cost $100,000. Architect not selected.

Calif., Sacramento—The Buffalo Brewing Co., 1717 21st St., plans to repair and build additions to its ice plant, on 22nd St. Estimated cost $10,000.

Calif., San Francisco—Ehrman & Co., 546 3rd St., is having plans prepared for the construction of a 3 story cigar factory on Bryant St. near 3rd St. Estimated cost $25,000. S. Heiman, 57 Post St., Archt.

Calif., San Francisco—Meyer Bros., 5326 Geary St., will build a 2 story, 100 x 100 ft. planing mill on Custer Ave. near Quint St. Estimated cost $7,000.

Calif., Sebastopol—The Western Apple Vinegar Co., McKinley St., has purchased site and plans to build an addition to its dehydrator plant.

Calif., Visalia—The Visalia Agricultural Wks. plans to build a factory on a 132 x 654 ft. site on Pratt Villa Tract. J. S. Johnson, 415 North Garden St., member of company.

Conn., Bridgeport—A. V. Langenegger, 395 West Morgan Ave., manufacturer of corsets, awarded the contract for the construction of a 3 story factory, 170 ft. front, on Federal St. Estimated cost $150,000. Noted Jan. 4.

Conn., Bridgeport—The New Haven Dairy Co., 201 Hazel St., New Haven, is having plans prepared for the construction of a 3 story, 75 x 85 ft. ice cream plant on Garden St., and South Ave., here. Estimated cost $150,000. F. E. Brown, 11 Autumn St., New Haven, Archt. Noted Jan. 4.

Conn., New Haven—R. G. Davis & Sons, 552 Grand Ave., awarded the contract for the construction of a 3 story, 50 x 125 ft. grain and flour plant. Estimated cost $60,000.

Idaho, Lewiston—The Prairie Land Co. will receive bids until Feb. 20 for the construction of a flour mill and elevator. Estimated cost $28,000. Glasser Contr. Co., Hutton Bldg., Spokane, Wash., Engrs.

Idaho, Weippe—The Lola Lumber Co. plans to build a band sawmill. Estimated cost $35,000.

Md., Baltimore—The Amer. Ice Co., Calvert Bldg., will receive bids until Jan. 19 for the construction of a 2 story, 80 x 142 ft. ice manufacturing plant on Eden St. between Madison and Monument Sts. Estimated cost $100,000. C. L. Weir, 41 East 42nd St., New York City, Archt.

Md., Baltimore—Frank A. Munsey Co., 280 Bway., New York City, has had plans prepared for the construction of a 2½ story, 96 x 200 ft. newspaper plant on Centre St., Paul Pl. and Hamilton St., here. Estimated cost $450,000. McKim, Meade & White, 101 Madison Ave., New York City, Archts.

Md., Orangeville (Baltimore P. O.)—The Gelfand Mfg. Co., 210 South Paca St., manufacturer of mayonnaise, is having plans prepared for the construction of a 3 story, 32 x 101 ft. factory, here. Estimated cost $150,000. H. G. Epstein, 330 15th St., N. E., Wash., D. C., Archt.

Mass., Holyoke—The Germania Mills, Race and South Sts., manufacturer of woollens, awarded the contract for the construction of a 6 story, 70 x 300 ft. manufacturing and storage building. Estimated cost $300,000.

Miss., Orvisburg—The Nortac Mfg. Co., Poplarville, plans to build a lumber mill, here. Estimated cost $125,000. Architect not announced.

Mo., St. Louis—R. Britton awarded the contract for the construction of a 2 story, 112 x 124 ft. chair factory on Rankin Ave. Estimated cost $55,000.

Mo., St. Louis—The Carr-Trombly Mfg. Co., 2nd and Branch Sts., will soon award the contract for the construction of a 3 story, 130 x 220 ft. addition to its chair factory, on 1st St. Estimated cost $50,000. A. B. Grove, 314 North 4th St., Archt.

Mo., St. Louis—The Von Hoffman Press, 9th and Walnut Sts., will soon receive bids for the construction of a 7 story, 61 x 125 ft. addition to its printing plant. Estimated cost $175,000.

N. J., Atlantic City—Peter Hernig's Sons Co., Inc., Connecticut and Baltic Sts., is having plans prepared for the construction of a 1 story, 933 x 100 ft. milk depot on Pennsylvania and Mediterranean Aves. Estimated cost $40,000. W. H. Tunius, Perry Bldg., Phila., Archt.

N. J., Trenton—The Trenton Potteries Co. awarded the contract for the construction of a 4 story, 72 x 114 ft. pottery on Lalor St. Estimated cost $95,000.

N. Y., Batavia—The W. N. Clark Co., Holcomb, plans to build a large canning factory, here. Estimated cost $100,000. Architect not announced.

N. Y., Buffalo—Montgomery & Co., Court St., plan to rebuild their lumber plant, which was destroyed by fire. Estimated cost $200,000. Architect not announced.

N. Y., New York—The Arctic Hygeia Ice Mfg. Co., 300 East 133rd St., is having plans prepared for the construction of an addition to its ice plant. Estimated cost $500,000. Ophuls & Hill, 112 West 42nd St., Archts.

N. Y., Oswego—The Oswego Netherlands Co. awarded the contract for the construction of a 1 and 2 story ice cream plant. Estimated cost $180,000. Noted Nov. 30.

N. Y., Penn Yan—F. Gizliello plans to build a 26 x 40 ft. factory for the manufacture of box crates and similar wooden products on Seneca St. Cost will exceed $5,000.

N. Y., Tonawanda—The Hoeffler Ice Cream Co., 61 Fillmore Ave., has purchased site and plans to build an ice cream factory on Seymour and Adam Sts. Cost will exceed $50,000. Architect not selected.

N. C., Charlotte—Lockwood, Greene & Co., Engrs. and Archts., Piedmont Bldg., are receiving bids for the construction of a 4 story, 150 x 180 ft. factory for the H. M. Wade Mfg. Co., South Graham St., manufacturer of show cases and fixtures. Estimated cost $130,000. Noted Dec. 28.

O., Ashland—The Faultless Rubber Co. has had plans prepared for the construction of a 1 and 2 story, 40 x 130 ft. warehouse and factory. Estimated cost $50,000. Osborn Eng. Co., 2848 Prospect Ave., Cleveland, Engrs. and Archts.

O., Cleveland—The Eclipse Electrotype & Engraving Co., 2041 East 3rd St., plans to build a 5 story engraving plant on 67 x 170 ft. lot at 1457 Superior Ave. Estimated cost $200,000. Architect not selected.

O., Cleveland—The Fuller Cleaning Co., 7606 Carnegie Ave., is having plans prepared for the construction of a 3 story dry cleaning plant. Estimated cost $60,000. W. H. Theobald, Pres. J. F. Steffens, Fidelity Mortgage Bldg., Archt.

O., Cleveland—The Manufacturers Brush Co., 1950 West 114th St., awarded the contract for the construction of a 1 story, 32 x 99 ft. factory. Estimated cost $15,000.

O., Columbus—The H. C. Goodman Co., 31 North 4th St., is having plans prepared for the construction of a 1 story factory for the manufacture of leather board on West State St. Estimated cost $75,000. Richards, McCarty & Bulford, 584 East Broad St., Archts.

O., Columbus—The National Ice & Storage Co., 5th and Naghten Sts., awarded the contract for the construction of a 1 story ice plant. Estimated cost $20,000. Noted Oct. 19.

O., Dayton—The Charles Zonars Co., 116 West 4th St., manufacturer of confectionery, plans to build a 3 story, 57 x 132 ft. factory on 5th and Wilkinson Sts. Estimated cost $150,000. Architect not selected.

Pa., Allentown—The Penn Throw Silk Co., Lena and Collom Sts., is having plans prepared for the construction of a 2 story, 90 x 120 ft. silk mill, here. Estimated cost $60,000. W. Steele & Sons, 16th and Arch Sts., Archts.

Pa., Ardmore—J. E. Caruso & Sons, 45 West Lancaster Ave., is having plans prepared for the construction of a 2 story, 30 x 70 ft. furniture factory. Estimated cost $25,000. C. Norton, Ardmore, Archt.

Pa., Bakerton (Elmora P. O.)—The Sterling Coal Co awarded the contract for the construction of a coal tipple, rock dump, picking table and screen. Estimated cost $250,000. W. Lamont, Genl. Supt.

Pa., Coraopolis—The Coraopolis Ice Co. will build a 1 story, 32 x 60 ft. addition to its ice plant on 4th and Kendall Sts.

Pa., Creighton—The Pittsburgh Plate Glass Co., 1600 Frick Bldg., Pittsburgh, plans to build a manufacturing plant, capacity 15,000,000 to 20,000,000 ft. of glass, here. Estimated cost $3,000,000. Architect not selected.

Pa., Easton—The Binney & Smith Co., manufacturer of crayons, is having plans prepared for the construction of a 4 story 80 x 100 ft. manufacturing plant, etc. Lockwood, Greene & Co., 101 Park Ave., New York City, Engrs. and Archts.

Pa., Farmers Valley—The B. B. Stroud Gasoline Co., Coleville (Bellefonte P. O.), plans to build an oil refinery, here. Estimated cost $70,000. Architect not announced.

Pa., Hughesville—The Buyers Mfg. Co. plans to build an addition to its plant for the manufacture of toy furniture. Cost will exceed $20,000. Architect not announced.

Pa., Mount Carmel—The Mount Carmel Item is having plans prepared for the construction of a 3 story, 50 x 50 ft. printing plant. Estimated cost $45,000. W. Steele & Sons, 16th and Arch Sts., Phila., Archts.

Pa., Phila.—Baker & Co., Canal and Fountain Sts., awarded the contract for the construction of a 3 story textile factory. Estimated cost $15,000.

Pa., Phila.—C. E. Wunder, Archt., 1415 Locust St., is receiving bids for the construction of a 7 story, 95 x 276 ft. paper products factory on Water, Swanson and South Sts., for the Amer. Bag & Paper Co., 2nd and Vine Sts. Estimated cost $600,000.

Pa., Pittsburgh—The Hollander Lewis Co., 1316 Forbes St., is having plans prepared for the construction of a 2 story, 80 x 135 ft. addition to its pants factory. Estimated cost $40,000. T. Hannah, Publication Bldg., Archt.

Pa., Pottstown—The Model Tire Co. plans to build a 1 story addition to its tire factory. Cost will exceed $15,000. G. Starkweather, Pres. Architect not announced.

Tenn., Knoxville—The Cherokee Brick Co. plans to build a plant on a 20 acre site, capacity 40,000 brick, per day. Architect not announced.

Tex., Dallas—The Oak Cliff Paper Mills is having plans prepared for the construction of a box factory on Oak Cliff. Estimated cost $75,000. E. T. Fleming, Pres. Architect not announced.

Tex., Fort Worth—The Arctic Ice Co. is receiving bids for the construction of a 2 story ice plant on Jassamine and Clay Sts. Estimated cost $60,000. Architect not announced.

Wis., Milwaukee—The Wisconsin Ice & Coal Co., 216 West Water St., awarded the contract for the construction of a 1 story, 56 x 100 ft. addition to its ice manufacturing plant. Estimated cost $20,000.

Wis., North Bend—The North Bend Cooperative Creamery Co. plans to build a 2 story creamery in the spring. Estimated cost $15,000. J. Patterson, Pres. Architect not selected.

Wis., Racine—The Davies Shoe Mfg. Co., Northwestern and Carlisle Aves., is having plans prepared for the construction of a 3 story, 39 x 90 ft. addition to its factory. Estimated cost $50,000. E. B. Funston Co., James Bldg., Archts. Noted Nov. 2.

Wis., Sheboygan—J. and W. Jung Co., 720 North 8th St., is having plans prepared for the construction of a 1 story, 50 x 100 ft. refrigerating plant. Estimated cost $50,000. W. C. Weeks, 720 Ontario Ave., Archt.

Wis., Sheboygan—The Sheboygan Fruit Box Co., North 15th St., awarded the contract for the construction of a 1 story, 60 x 112 ft. addition to its factory for the manufacture of fruit boxes. Estimated cost $20,000.

Wis., Sturgeon Bay—The Fruit Growers' Canning Co. is having plans prepared for the construction of a canning plant, consisting of a 3 story, 122 x 130 ft. warehouse, a 2 story, 84 x 144 ft. boiler house and preserving building and a 1 story, 48 x 98 ft. receiving building. Estimated cost $225,000. McMeans & Tripp, Majestic Bldg., Indianapolis, Archts.

Ont., Kirkland Lake—The Lebell Crystal Lake Gold Mine plans to build a mining plant. H. S. Rose, Pres.

Ont., Fort Dover—The Port Dover Planing Mills plan to rebuild its mill which was partially destroyed by fire.

Ont., Welland—The Welland Cotton Mills, Ltd. awarded the contract for the construction of a 1 and 2 story, 100 x 350 ft. cotton mill. Estimated cost $250,000. C. T. Grantham, Mgr. Noted Dec. 14.

Que., East Broughton—The Asbestos Mines, Ltd., plans to rebuild its plant, which was destroyed by fire. Estimated cost $200,000. Architect not announced.